A Dissertation on

A STUDY ON ULTRASOUND SCORING PREDICTING THE CONVERSION OF LAPAROSCOPIC TO OPEN CHOLECYSTECTOMY

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in partial fulfilment of the regulations for the Award of the degree of

M.S. (General Surgery)

Branch – I

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CHENNAI

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BONAFIDE CERTIFICATE

Certified that this dissertation is the bonafide work of **Dr. D.JEGADHES KUMAR** on "**A STUDY ON ULTRASOUND SCORING PREDICTING THE CONVERSION OF LAPAROSCOPIC TO OPEN CHOLECYSTECTOMY"** during his M.S. (General Surgery) course from June 2013 to June 2016 at the Madras Medical College and Rajiv Gandhi Government General Hospital, Chennai in partial fulfillment of the rules and regulations laid down by The Tamil Nadu Dr. MGR Medical University, Chennai, Tamil Nadu.

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DECLARATION

I, declare that this dissertation titled "**A STUDY ON ULTRASOUND SCORING PREDICTING THE CONVERSION OF LAPAROSCOPIC TO OPEN CHOLECYSTECTOMY"** represents a genuine work of mine. The contributions of any supervisors to the research are consistent with normal supervisory practice, and are acknowledged, I also affirm that this bonafide work or part of this work was not submitted by me or any others for any award, degree or diploma to any other University board, either in India or abroad. This is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfillment of the rules and regulations for the award of Master of Surgery Degree Branch I (General Surgery).

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ABSTRACT

BACK GROUND AND OBJECTIVES:

The aim of this study is to preoperatively predict the conversion of Laparoscopic to open cholecystectomy by using ultrasound scoring the following factors **GB status, GB wall thickness, number of stones , pericholecystic collection , stone size**

METHODOLOGY:

A total of 50 cases with gall stones admitted in RGGGH, madras medical college during the period of January 2015 to September 2015 and planned for laparoscopic cholecystectomy were analysed in this study , they are subjected to detailed history, clinical examination , name , age , sex and findings of USG abdomen were recorded , All these patients were subjected to laparoscopic cholecystectomy.

RESULT:

Out of 50 patients,

GB status - 35 patients GB status was normal, of the remaining 15 patients in which GB distended, 5 cases were converted to open , the statistical analysis also shows this difference to be significant with a p value of 0.001, GB wall thickness – 37 cases in which the GB wall thickness was < 3mm , it was possible to do surgery in laparoscopic itself. Of the remaining 13 cases in which GB was thickened , 5 cases were converted to open , the statistical analysis also shows this difference to be significant with a p value of 0.001, number of stones alone is not significant factor to predict conversion into open, pericholecystic collection – 39 cases in which pericholecystic collection was not there , it was possible to do surgery in laparoscopic itself, of the remaining 11 cases

had pericholecystic collection , 5 cases were converted to open, the statistical analysis also shows this difference to be significant with a p value of 0.001,stone size – 46 cases in which stones were <5mm, 3 cases were converted, of the 3 cases in which stones were between 5mm and 1 cm, 2 cases were converted to open . the one case stone > 1cm was done by laparoscopic , the statistical analysis also shows this difference to be significant with a p value of 0.003

CONCLUSION:

In our study noted that as the USG score increases the chance of the cases being opened increases and all the opened cases had either score 11 or 12 , the statistical analysis also shows the difference to be significant with a p value of 0.001, among the USG factors , a distended GB, increased GB wall thickness, presence of pericholecystic collection ,large size stones proved to be significant and was associated with increased risk of conversion to open cholecystectomy

KEY WORDS: GB - gall bladder, USG- ultrasonogram

CONTENTS

INTRODUCTION

INTRODUCTION

“Laparoscopic cholecystectomy (LC) has become the treatment of choice for gallstones. Laparoscopiccholecystectomy is established as the primary procedure forthe vast majority of patients with benign gallbladder disease.

Conversion to open cholecystectomy is occasionally needed to avoid or repair injury, delineate confusing anatomic relationships, or treat associated conditions[6].”

“Conversion to open cholecystectomy has been associated with increased overall morbidity, surgical site and pulmonary infections, and longer hospital stays.The ability to accurately identify an individual patient’s risk for conversion based on preoperative information can result in more meaningful and accurate preoperative counselling, improved operating room scheduling and efficiency, stratification of risk for technical difficulty, may improve patient safety by minimizing time to conversion, and also helps to identify patients in who a planned open cholecystectomy is indicated[12].”

“In our study we evaluated various clinical, haematological and USG factors to preoperatively predict the conversion of laparoscopic cholecystectomy to open cholecystectomy".

AIM OF THIS STUDY

AIMS OF THE STUDY

The aim of this study is to preoperatively predict the conversion of Laparoscopic to open cholecystectomy by using ultrasound scoring the following factors:

1. GB Status

2. GB Wall thickness

3. No of stones

4. Pericholecystic collection

5. Stone size

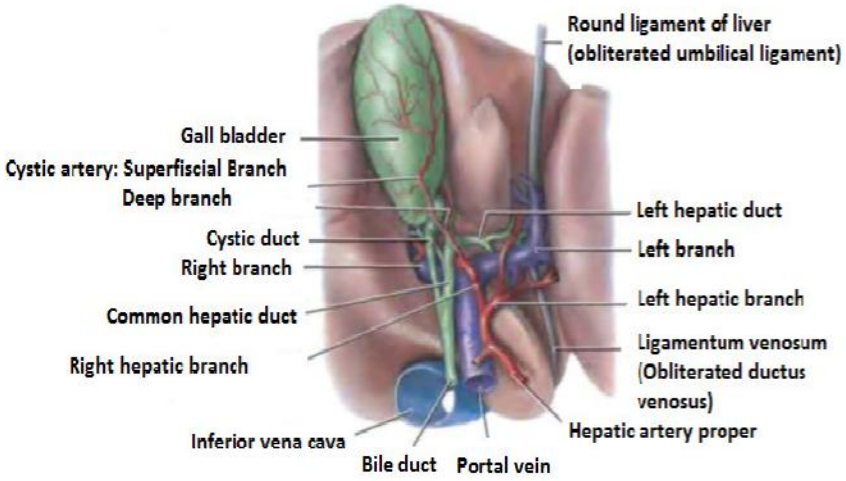
- The above USG scoring factors are analysed in this study to preoperatively predict the conversion of Laparoscopic to Open cholecystectomy

REVIEW OF LITERATURE

REVIEW OF LITERATURE

SURGICAL ANATOMY OF GALL BLADDER:

"A Gallbladder is a flask shaped organ attached to the common bile duct by the cystic duct. It lies on the visceral surface of the liver at the junction of quadrate lobe and right lobe of the liver along the line of Rex. It usually lies in a shallow fossa in the liver parenchyma covered by the peritoneum continued from liver surface. The gall bladder lies on a fibrous or a cystic plate which is referred to as the hilar plate which is a part of the perihilar system of the fibrous tissue. The cystic plate attaches directly on to the anterior surface of right portal pedicle. The hepatic parenchyma lies deep to the cystic plate through which small bile duct may penetrate to enter the gall bladder. These ducts of Luschka consists of accessory ducts less than 1 mm in diameter. During dissection of gall bladder from the liver the posterior surface of the cystic artery and bile duct will be reached when the areolar tissue is left on the cystic plate".



"If dissection is undertaken deep into the cystic plate the surface to the right portal pedicle may be breached and result in injury to right portal pedicle and right hepatic duct".

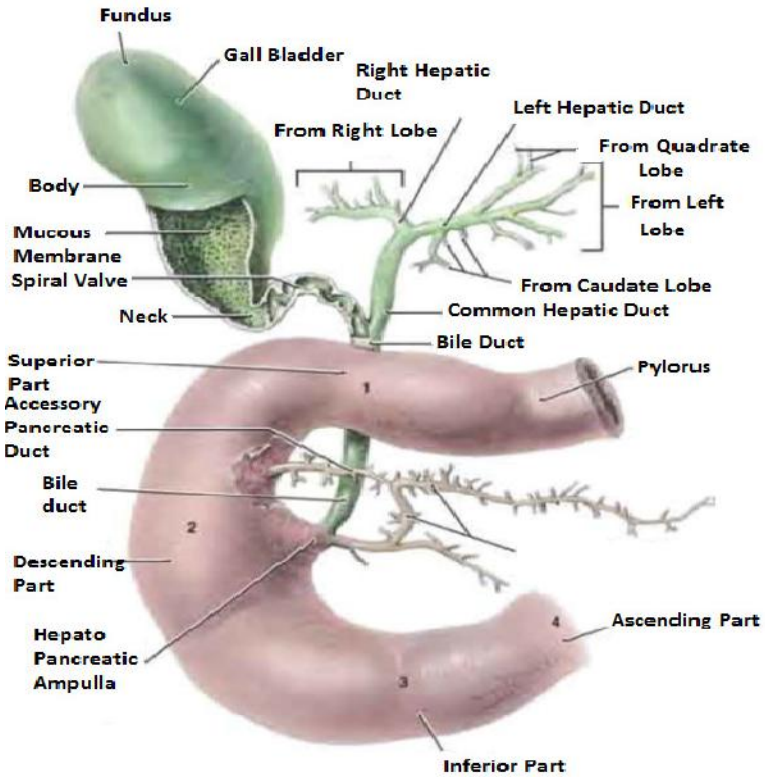
"The anatomical divisions of gallbladder are fundus, body and neck that terminates in a narrow infundibulum. Hartmann's pouch is pathological one located in the infundibular region created by gallstones. The indentations of the mucosa that are prent in the mucous membrane and that sink into the muscle coat are the crypts of Luschka".

NECK:

"The neck turns upwards and forwards and then sharply backwards and downwards to become the cystic duct. The mucosa lining the neck is a spiral ridge forming a spiral groove, which is continuous with the spiral valve of cystic duct (valve of Heister)".

BODY AND FUNDUS:

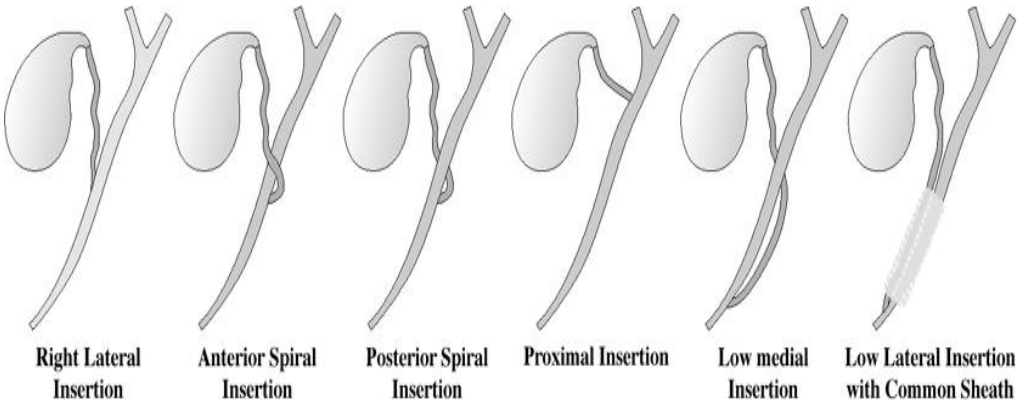
"The body of the gall bladder normally lies in contact with the liver surface. The fundus lies at the lateral end of the body and usually projects past the inferior border of the liver. It often lies in contact with the anterior abdominal wall at the point where the lateral edge of the right rectus abdominis muscle crosses the ninth costal cartilage. This is the location where tenderness can be elicited in cholecystitis. The fundus of gall bladder may be folded back upon the body of gall bladder: PHRYGIAN CAP".



CYSTIC DUCT:

"A cystic duct is about 3 to 4 cm in length and joins with the common hepatic duct forming the common bile duct. It runs parallel to it and is adherent to the common hepatic duct for a short distance before joining it. The cystic duct mucosa is arranged in numerous spiral folds called the 'valves of Heister' and the wall is surrounded by a sphincteric structure known as the sphincter of Lütkens'. The cystic duct drains at an acute angle into the common bile duct. There are a number of anatomic variations in insertion of the cystic duct, including into the right hepatic duct".

ANATOMICAL VARIATIONS OF CYSTIC DUCT:



HEPATIC DUCT:

"The Common Hepatic duct is formed by the union of right and left hepatic duct in the portahepatis. This descents for about 3 cm before joining the cystic duct at an acute angle to form the common bile duct. The hepatic artery lies to the left of common hepatic duct and portal vein lies posterior to it".

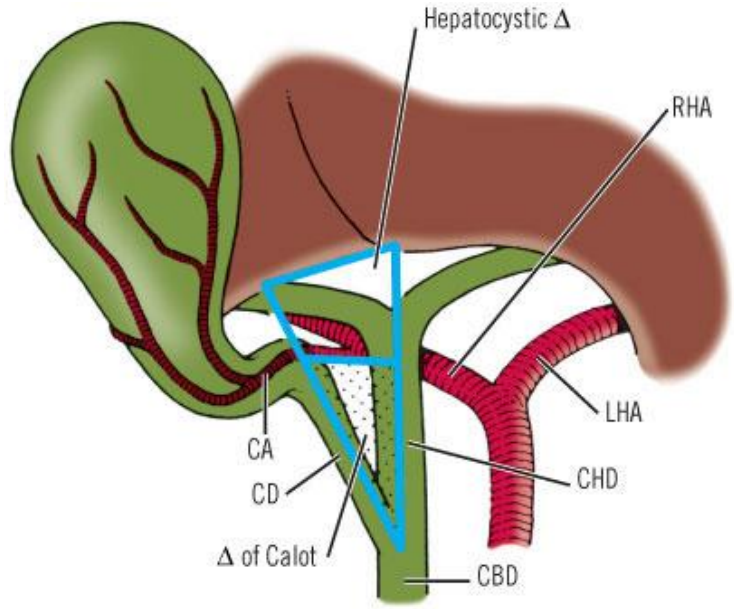
COMMON BILE DUCT:

"Common hepatic duct and cystic duct joins to form the Common Bile duct.. It is about 6 to 8 cm in length and about 6mm in diameter. It lies anterior and to the right of portal vein and to the right of hepatic artery. It passes behind the first part of duodenum with the gastroduodenal artery on its left and then runs in groove on the superolateral part of posterior surface of pancreas".

HEPATOPANCREATIC AMPULLA (OF VATER):

"It is formed by the union of CBD and pancreatic duct before entering the 2^{nd} part of the duodenum. Circular muscles usually surround the lower part of the CBD(bile duct sphincter),and frequently also surround the terminal part of the main pancreatic duct(pancreatic duct sphincter)and the hepatopancreatic ampulla(sphincter of oddi)".

CALOT'S TRIANGLE:



" Calot's triangle or the hepatobiliary triangle is the space bordered by the cystic duct inferiorly, the common hepatic duct medially and the superior border of the cystic artery. This was first described in 1891 by Jean-François Calot. Another triangle seen in the region of gallbladder is the hepatocystic triangle".

"The two triangles differ in their upper boundaries. The upper boundary of Calot's triangle is the cystic artery, whereas that of the hepatocystic triangle is the inferior margin of the liver. A thorough appreciation of the anatomy of Calot's triangle is essential during performance of a cholecystectomy because numerous important structures pass through this area".

CONTENTS OF CALOTS TRIANGLE:

1) Cystic artery as it approaches the GB.

2) Cystic lymphnode.

3) Lymphatics from the GB.

4) 1 or 2 small cystic veins.

5) Autonomic nerves running to the GB.

6) Some adipose tissue.

In most instances, the cystic artery arises as a branch of the right hepatic artery within the hepatocystic triangle. A replaced or aberrant right hepatic artery arising from the superior mesenteric artery usually courses through the medial aspect of the triangle, posterior to the cystic duct. Aberrant or accessory hepatic ducts also may pass through Calot's triangle before joining the cystic duct or common hepatic duct. During performance of a cholecystectomy, clear visualization of the hepatocystic triangle is essential with accurate identification of all structures within this triangle.

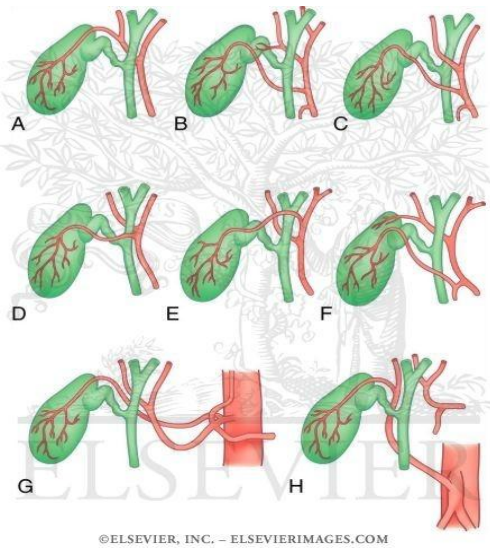
“The area where the hepatic artery takes a tortuous course in front of the origin of the cystic duct is the most dangerous anomaly. The right

hepatic artery is tortuous and the cystic artery short. This tortuosity is known as the 'caterpillar turn' or 'Moynihan hump'. This is the main reason for difficult cholecystectomy".

BLOOD SUPPLY:

"Gallbladder is supplied by Cystic artery. The cystic artery arises from the right hepatic artery, which can pass posterior or anterior to the common bile duct to supply the gallbladder. Similar to the variability of the cystic duct, the cystic artery may arise from the right hepatic, left hepatic, proper hepatic, common hepatic, gastroduodenal, or superior mesenteric artery. Although variable, the cystic artery generally lies superior to the cystic duct and is usually associated with a lymph node, known as Calot's node. Because this node provides some of the lymphatic drainage of the gallbladder, it can be enlarged in the setting of gallbladder pathology, whether inflammatory or neoplastic".

ANATOMICAL VARIATIONS:



1) Cystic artery may arise from the common hepatic artery, sometimes from the left hepatic artery and rarely from the gastroduodenal or superior mesenteric arteries.

2) An accessory cystic artery may arise from the common hepatic artery or one of its branches.

3) The cystic artery often bifurcates close to the origin and gives rise to two arteries supplying the gall bladder.

4) Multiple fine arterial branches may arise from the hepatic parenchyma (segment IV or V) and contribute to supply the body of the gall bladder.

5) Cystic artery occlusion is associated with gangrene of the gallbladder as it is the only artery supplying the gallbladder.

VENOUS DRAINAGE:

Veins that drain the gallbladder are called Cystic veins. Those arising from the superior surface of the body and neck and lie in the areolar tissue between the gall bladder and liver and enters the liver parenchyma to drain into the segmental portal veins. The remaining cystic veins drains into the liver directly or after joining the veins draining the hepatic duct.

LYMPHATIC DRAINAGE:

"The cystic lymph node of Lund (the sentinel lymph node) is the main lymphatic drainage of gallbladder, which lies at the junction of the cystic and common hepatic ducts. Efferent vessels from this lymph node reach the hilum of the liver, and from there to the coeliac lymph nodes". "The subserosal lymphatic vessels of the gall bladder also connect with the subcapsular lymph channels of the liver, and this accounts for the frequent spread of carcinoma of the gall bladder to the liver".

INNERVATION:

"The gallbladder and the extra hepatic biliary tree are innervated by the branches from the hepatic plexus. The retroduodenal part of the

CBD also receives contribution from the pyloric branch of the Vagus. It also innervates of the smooth muscles of the hepato pancreatic ampulla.

foregut. This outgrowth, the hepatic diverticulum or the hepatic bud consists of rapidly dividing cells that penetrate the septum transversum, that is the mesodermal plate between the pericardial cavity and the stalk of the yolk sac.

GALL STONES – PREVALENCE:

"Cholelithiasis is a common disease throughout the Western world. Gallstones can be found in 10% to 20% of the western population at some stage of life. In both sexes the prevalence increases with age; however, overall gallstones are more common in females than in males with a ratio of 4:1. Obesity and family history are also significant risk factors. The prevalence of gallstones is related to many factors like age, gender, ethnicity. Many factors predispose to the development of gallstones. They include obesity, pregnancy, dietary factors, Crohn's disease, terminal ileal resection, gastric surgery, hereditary spherocytosis, sickle cell disease, and thalassemia".

NATURAL HISTORY:

"Most patients with gallstones remain asymptomatic throughout life. Around 3% of asymptomatic individuals become symptomatic per year and develop biliary colic. Once symptomatic they develop recurrent episodes of biliary colic. Only few patients without biliary symptoms develop complications. Prophylactic cholecystectomy for asymptomatic cholelithiasis is rarely indicated. Elderly patients with diabetes mellitus, individuals who will be isolated from medical care for a prolonged period of time, Gall bladder polyp > 1 cm are indications for prophylactic cholecystectomy.

ETIOLOGY:

"Gallstones are classified by their cholesterol content as cholesterol stones and Pigment stones. Pigment stones are further classified into black and brown pigment stones. In the United States and Europe, 80 per cent are cholesterol or mixed stones, whereas in Asia, 80 per cent are pigment stones. Cholesterol or mixed stones contain 51–99 per cent pure cholesterol plus an admixture of calcium salts, bile acids, bile pigments and phospholipids".

CLINICAL PRESENTATION:

"Most patients remain asymptomatic from their gallstones. Although mechanism unclear some develop symptomatic gall stones, with biliary colic caused by stone obstructing the cystic duct. Only 1 to 2% of the asymptomatic individuals with gallstone will develop serious symptoms or complications related to their gall stone per year. Therefore only 1% require cholecystectomy. Once symptomatic patients tend to have recurring symptoms, usually repeated episodes of biliary colic. Non-specific gastrointestinal symptoms will develop in 10 to 30% of patients and 5 to 10% develop classic biliary symptoms".

BILIARY COLIC

"Acute obstruction of gall bladder by calculi results in biliary colic, a common misnomer because the pain is not colicky in the epigastrium or right upper quadrant".

"Biliary colic is a constant pain that builds in intensity and can radiate to the back, interscapular area or to the right shoulder. The pain is described as a band like tightness of upper abdomen, that may be associated with nausea and vomiting. This is due to a normal gallbladder contracting against a luminal obstruction, such as a gallstone impacted at

the neck of gallbladder, the cystic duct or the CBD. The pain is most commonly trigerred by fatty foods, but it can also be initiated by other kind of foods or even occur spontaneously. An association with meals is present only in 50% of patients.

REFERRED PAIN:

In common with other structures of foregut origin, pain from stretch of CBD or gallbladder is referred to the central epigastrium. involvement of overlying somatic peritoneum produces pain which is more localized to the right quadrant.

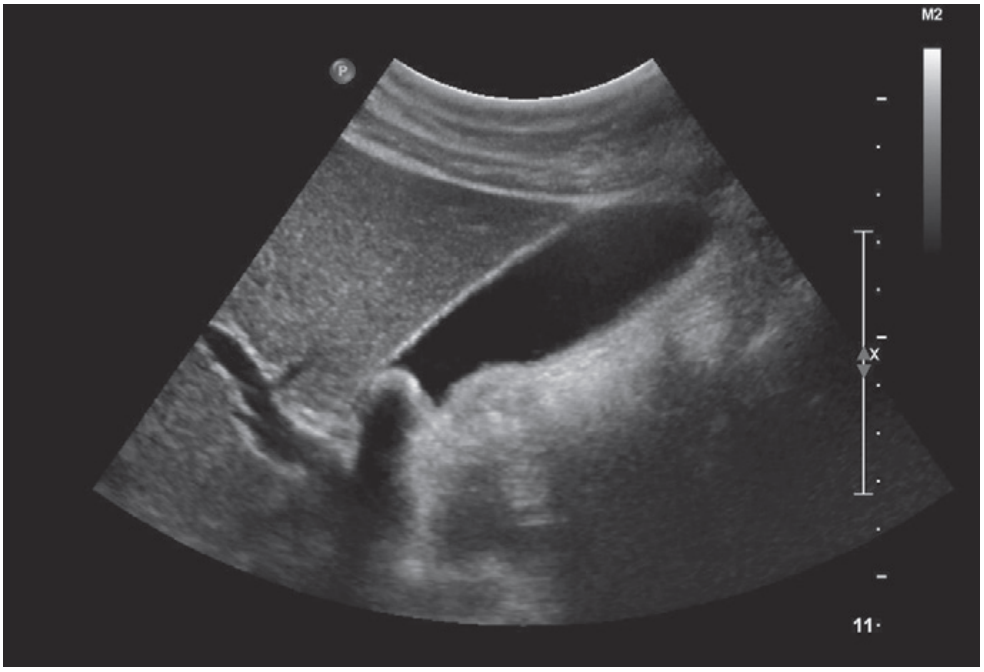
INVESTIGATION:

ULTRASOUND:

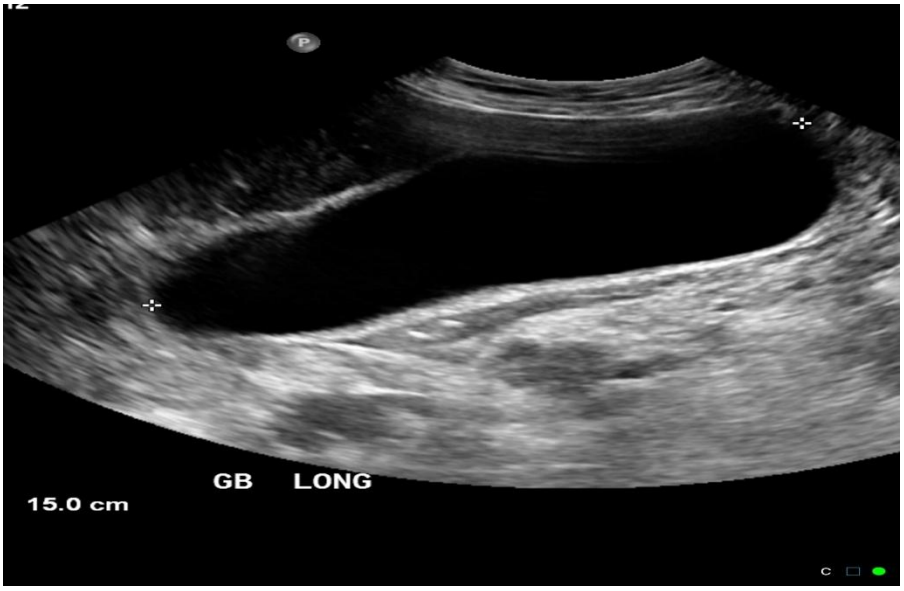
"Transabdominal ultrasound is a sensitive, reliable and inexpensive test to evaluate most of the biliary tract and to separate medical jaundice patients from those with surgical jaundice. It does not submit the patient to radiation and is useful in critically ill patients. Gallbladder diseases are usually diagnosed by ultrasound, because of its superficial location with no overlying bowel gas enables its evaluation by sound waves thus making it the investigation of choice for gallstones. Ultrasound has a high specificity and sensitivity of more than 90%

forcholelithiasis, or gallstones. The density of gallstones allows crisp reverberation of the sound wave, showing an echogenic focus with a characteristic shadowing behind the stone. The patient has acute cholecystitis if edema is seen within the wall of the gallbladder or between the gallbladder and liver with tenderness. Pathologic changes seen in gallbladder diseases can beidentified by ultrasound. For example, the gallbladder wallthickening and pericholecystic fluid collection seen in cholecystitis can be detected by ultrasound. Porcelain or calcified gallbladder appear as a curvilinear echogenic focus along the entire gallbladder wall with posterior shadowing".

ULTRASOUND SHOWING GALLSTONES



DISTENDED GB



PERICHOLECYSTIC COLLECTION

GB WALL THICKNESS

COMPLICATIONS OF GALLSTONES:

Biliary colic

- Acute cholecystitis
- Chronic cholecystitis
- Empyema of the gall bladder
- Mucocoele
- Perforation
- Biliary obstruction

- Acute cholangitis
- Acute pancreatitis
- Intestinal obstruction (gallstone ileus)

MANAGEMENT OF CHOLELITHIASIS

SURGICAL MANAGEMENT :

LAPAROSCOPIC CHOLECYSTECTOMY:

"Laparoscopic cholecystectomy is one of the most common surgeries performed and has replaced open cholecystectomy. In 1992, The National Institute of Health (NIH) consensus development conference stated that laparoscopic cholecystectomy "provides a safe and effective treatment for most patients with symptomatic gallstones[17]".

INDICATIONS OF LAPAROSCOPIC CHOLECYSTECTOMY:

a) SYMPTOMATIC CHOLELITHIASIS[30]:

i) Biliary colic: Once the patient experience symptoms, there is a greater than 80% chance that they will continue to have symptoms. There is also a finite risk of disease related

complications such as acute cholecystitis, gallstone pancreatitis and choledocholithiasis.

ii) Acute cholecystitis.

iii) Gallstone pancreatitis.

b) ASYMPTOMATIC CHOLELITHIASIS[30]:

"Patient with asymptomatic gallstone have less than 20% chance of ever developing symptoms, and the risks associated with prophylactic operation outweigh the potential benefit of surgery in most patients. Therfore prophylactic cholecystectomy is recommended in:

i) Sickle cell disease: Patients with sickle cell disease often have hepatic and vasoocclusive crisis that can be difficult to differentiate from acute cholecystitis.

ii) Total parenteral nutrition

iii) Chronic immunosuppression: In transplant patients, there is a concern that immunosuppression may mask the signs and symptoms of inflammation until overwhelming infection occurred.

iv) No immediate access to health care facilities (eg: missionaries, military" personal, peace corps workers, relief workers)

v) Incidental cholecystectomy for patients undergoing procedures for other indications.

c) Acalculouscholecystitis or biliary akinesia

d) Gallbladder polyps >1 cm in diameter.

e) Porcelain gallbladder".

TECHNIQUES OF LAPAROSCOPIC CHOLECYSTECTOMY:

"The techniques of Laparoscopic cholecystectomy has been changing over years. The conventional Laparoscopic cholecystectomy is done by four ports: a 10 mm optical port at umbilicus, a 10 mm and a 5mm port in epigastrium and in midclavicularline respectively and another 5 mm port in the midaxillary line at the level of umbilicus for the assistant to retract the fundus of gall bladder".

"Over years with increasing experience, laparoscopic cholecystectomy has undergone many changes including reduction in port size and number. Some surgeons tried laparoscopic cholecystectomy through two ports. This required the introduction of transabdominal sutures through the anterior abdominal wall for retracting the gall bladder during dissection[34].

APPROACH

A) NORTH AMERICAN APPROACH

"The patient is kept in supine in reverse trendelenberg position (15 degree head up tilt) with left lateral tilt (15-20 degree).this ensures that the bowel and Omentum falls down and medially, away from the operative site. The operating surgeon and camera surgeon stand on the left of the patient while the assistant surgeon stands on the right of the patient".

PREOPERATIVE PREPARATION[32]:

1) Blood coagulation should be normalized in patients with prior, by giving vitamin K (IM in 3 doses)

2) A prophylactic antibiotic preferably a second generation cephalosporin is given at the time of anaesthesia induction.

3) To prevent deep venous thrombosis, subcutaneous heparin or antiembolic stocking are used.

PROCEDURE OF LAPAROSCOPIC CHOLECYSTECTOMY[35]:

"The North American approach is usually followed. The patient is placed on the operating table with the surgeon standing on the left side of the patient and the first assistant standing on the patients right. Following induction of general endotracheal anaesthesia, an orogastric tube is inserted to decompress the stomach. Abdomen is painted from nipple to midthigh[35]".

"Pneumoperitoneum created with carbondioxide provides the working space. The surgeon needs this working space for operating within the abdominal cavity. Carbondioxide is non-combustible. It is rapidly absorbed from the abdominal cavity. However in patients with severe cardiopulmonary disease it can lead to hypercarbia[32]".

"Pneumoperitoneum is created either by open technique or by closed technique.Initially, a small incision is made in the upper edge of the umbilicus. In the Closed technique,CO2 is insufflated into the peritoneal cavity through a Veress needle, which is subsequently replaced with a laparoscopic port, placed blindly into the abdominal cavity. In the Open (HASSON) technique, a small incision is made and a laparoscopic port is created under vision into the peritoneal cavity[33]".

“A 10-mm laparoscope is inserted into the abdomen through the periumbilical port and the abdominal cavity is inspected. The patient is placed in a Anti-Trendelenburg position of 30 degrees while rotating the table to the left by 15 degrees. This position allows the duodenum and colon to fall away from the liver edge. The liver and falciformligament are examined closely for abnormalities[26]”.

“Two small accessory subcostal ports are then placed under direct vision. The first 5-mm trocar is placed along the right anterior axillary line between the 12th rib and the iliac crest. A second 5-mm port is inserted in the right subcostal area in the midclavicular line. Grasping forceps are placed through these two ports to secure the gallbladder. The assistant manipulates the lateral grasping forceps, which are used to grasp the fundus and elevate the liver”.

“The fourth working port is then inserted through an incision in the midline of the epigastrium. This trocar is usually inserted approximately 5 cm below the xiphoid process, but the precise position and angle depends on the location of the gallbladder as well as the size of the medial segment of the left lobe of the liver”.

“Dissecting forceps are then inserted and directed toward the gallbladder neck. The surgeon uses a dissecting forceps to raise a serosal fold of the most dependent portion of the fundus. The assistant’s heavy

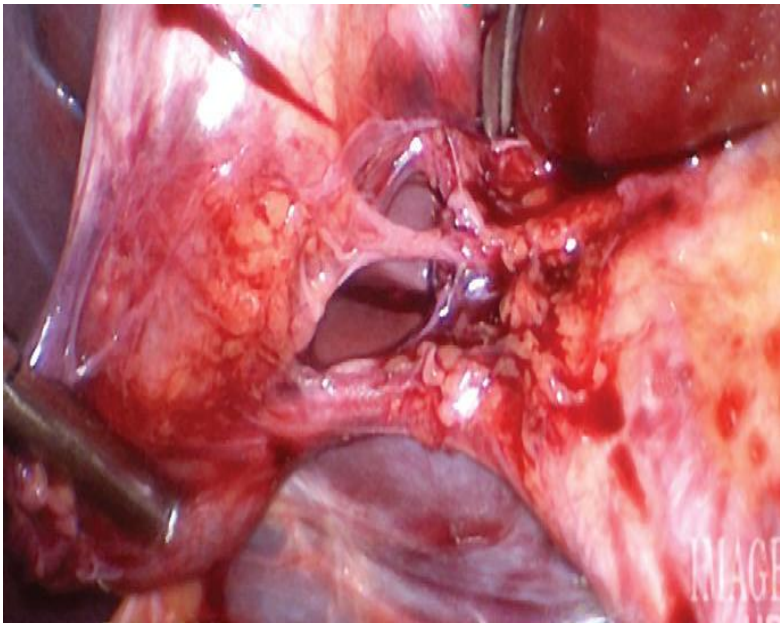
grasping forceps are then locked onto this fold using either a spring or ratchet device. With these axillary grasping forceps, the fundus of the gallbladder is then pushed in a lateral and cephalad direction, rolling the entire right lobe of the liver cranially".

DISSECTION OF THE CHOLECYSTOHEPATIC TRIANGLE(CALOTS TRIANGLE):

"The dissection starts at the junction of the gallbladder and the cystic duct. A helpful anatomic landmark is the cystic artery lymph node.The infundibulumis grasped, placing traction on the Gallbladder in a lateral direction to distract the cystic duct from the CBD. Fine-tipped dissecting forceps (Maryland) areused to dissect and seperate the overlying fibroareolar membrane from the gallbladder".

"The dissection should not begin from an unknown area but it should begin from the gallbladder,, to avoid damage to the underlying structures such as a bile duct or hepatic artery. The dissection initially commences 4 or 5 cm proximal to the neck of the gallbladder and proceeds distally, such that a modified "top-down" technique is employed[25]"

PEROP PICTURE SHOWING CALOTS TRIANGLE.



IDENTIFICATION OF THE CYSTIC DUCT AND ARTERY[34]:

"The infundibulum of gallbladder is retracted inferiorly and laterally and the hepatocystic triangle is thereby opened and converted into a trapezoid shape. The infundibulum of the gallbladder is pulled in a superior and medial direction so as to expose the reverse of calot's triangle".

"Structures from the apex of the triangle are cleared first, and then only the junction between the infundibulum and the origin of the proximal cystic duct can be tentatively identified".

“The peritoneal strands, lymphatic strands and neurovascular tissue over the cystic duct are stripped away to clear a segment from the surrounding tissue. Curved dissecting forceps are used to create a window around the posterior aspect of the cystic duct to skeletonize the cystic duct”.

“By similar blunt dissection cystic artery is also separated from surrounding structures. Thus the neck of the gallbladder is dissected away from the liver bed, leaving a large window at its base through which the liver parenchyma is visualized. There should be two, and only two, structures (the cystic duct and artery) crossing this window—this is the “critical view of safety,” which should be demonstrated prior to clipping or cutting any tubular structures”.

“The cystic duct is clipped using an endoscopic clip applier and divided using scissors. Two clips are placed proximally on the cystic duct and one clip is placed toward the gallbladder. For cystic ducts that are large or friable, a preformed endoloop is preferable for ligating the distal cystic duct”.

“After the duct is divided, the cystic artery is dissected from the surrounding tissue for an adequate distance to permit placement of three clips.Electrocautery should not be used for this division, as the current

may be transmitted to the proximal clips leading to subsequent necrosis and haemorrhage".

"The ligated stumps of the cystic duct and the artery are then examined to ensure that there is no leakage of either bile or blood and that the clips are placed securely and compress the entire lumen of the structures without impinging on adjacent tissues. A suction-irrigation catheter is used to remove any debris or blood that has accumulated during the dissection".

DETACHMENT OF GALLBLADDER FROM THE LIVER BED:

"Separation of the gallbladder away from its hepatic bed is then initiated using an electrosurgical probe to coagulate small vessels and lymphatics. While maintaining cephalad traction on the fundus of the gallbladder with the axillary forceps, the midclavicular forceps pulls the neck of the gallbladder anterosuperiorly and then alternatively medially and laterally to expose and place the tissue connecting the gallbladder to its fossa under tension.

Dissection of the gallbladder fossa continues from the infundibulum to the fundus, progressively moving the midclavicular grasping forceps cephalad to allow maximal counter traction. The final

attachments of the gallbladder are divided, and the liver edge is again examined for hemostasis".

EXTRACTION OF THE GB[34]:

Extraction of the GB can be done through umbilical or epigastric port. Epigastric port is preferred to extract the gallbladder because:

i) No need to change camera port.

ii) Facilitates thorough rinsing to avoid port tract infection.

iii) By extending skin incision, the fascial opening can be easily dilated and majority of GB extracted.

iv) Fascial opening closed easily by cutaneous approach.

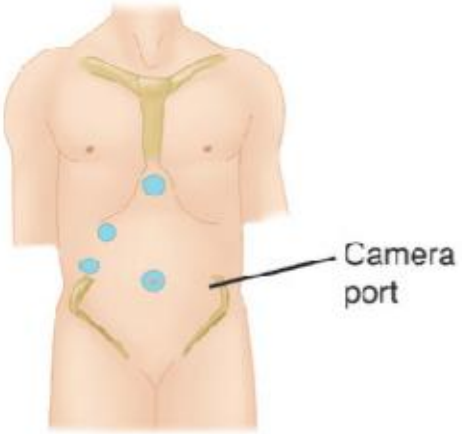
v) Better cosmetic appearance.

A claw shaped gallbladder extraction forceps is introduced and used to grasp the neck of the GB. If GB is too distended, the neck is pulled out through the skin incision, small nick made and bile suctioned and stones crushed using sponge holder.

If the GB is thick preventing its extraction the fascial incision is enlarged using a closed Robert's clamp or extending it. Infected or necrotic GB or a GB with suspicion of carcinoma is placed in a sterile bag before extraction to reduce port site infection".

If drain is needed a 14 F Redivac tube is placed through 5 mm trocar site lateral most port. Trocars are removed under direct vision to check for bleeding from trocar site. Pneumopritoneum evacuated and 10 mm ports closed with vicryl. The skin incisions at port sites is closed with absorbable sutures, skin closure adhesives.

PORT SITES

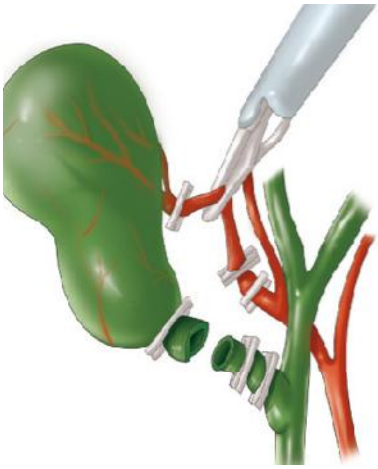


PORT PLACEMENT

STEP 2: Port Placement

DISSECTION OF CALOTS TRIANGLE

CLIPPING OF CYSTIC DUCT



COMPLICATIONS[35]:

The complications of Laparoscopic cholecystectomy are:

a) HEMORRHAGE:

i) TROCAR SITE BLEEDING:

Trocar site bleeding can be prevented by control of bleeding following skin incision and before inserting trocar.

Management: Pressure over the site of bleeding by tilting the trocar.

Injection of epinephrine 1:10000 in the vacinity of the bleeding site.

ii) HEMORRHAGE DUE TO BLUNT DISSECTION OF ADHESIONS can be managed with electrocautery.

iii) SUDDEN AND PULSATILE BLEEDING IN CALOT'S TRIANGLE

Bleeding in the calot's triangle can be prevented by careful dissection and proper application of clip to cystic artery.

iv) GALLBLADDER FOSSA BLEEDING

GB fossa bleeding can be controlled by electrocautery, packing the site with hemlock soacked gel foam, figure of eight stitch in case of spurter from liver parenchyma.

b) PERFORATION OF GALLBLADDER:

"GallBladder perforation seen in acute cholecystitis and while detaching GallBladder from the liver bed. This can be prevented by confining to the areolar tissue between the GallBladder and the liver bed during dissection and decompression of the gall bladder if distended. The likelihood of a complication when gallstone spillage occurred was 2.3% which was increased to 7.0% when unretrieved peritoneal gallstones were documented".

c) **DIFFICULTY IN EXTRACTION OF THE GALLBLADDER**

"Difficulty in extraction of the gallbladder is seen in gallbladder containing large stones and those with thick wall. In GallBladder containing large stones, the GallBladder is placed in an endobag, the neck retrieved out through the abdomen and stones are crushed and removed. In GallBladder with thickened wall ,theGallBladder is placed in an endobag and extracted".

d) OCCULT CARCINOMA

In cases suspected to have carcinoma intraoperatively, frozen section is sent and if frozen section is positive for carcinoma, then conversion to open technique is considered and radical surgery

e) POST OPERATIVE BILE LEAK

"Post operative bile leak can occur due to injury to the CBD, the right hepatic duct or accessory bile duct. In case of acute inflammation, the clip applied to the cystic duct may become loose once the edema subsides and subsequently slip off".

"This can be prevented by correct identification of the cystic duct and artery, minimum use of electrocautery in calot's triangle dissection and appropriate choice of laparoscopic subtotal cholecystectomy.in the setting of acute cholecystitis, when tight application of the clip is in doubt, it may be advisable to use a pre-tied suture loop or intra-corporeal suturing to occlude the cystic duct".

"Postoperative bile leak should be suspected in patients with fever, tachycardia and upper abdominal pain and tenderness persisting or appearing unexpectedly. The diagnosis can be confirmed by USG or ERCP. If drain is placed most of the minor leak will heal with expectant

management. In some persistent cases, it may be advisable to decrease the intraductal pressure by nasobiliary drainage, endoscopic spincterotomy or transpapillary stenting".

f) BILE DUCT INJURY

Incidence of CBD injury during Laparoscopic cholecystectomy exceeds that of open cholecystectomy ie 0.5% vs 0.2%.21 Reasons for the increase in injury during Laparoscopic cholecystectomy included loss of haptic information, incorrect traction forces to the gallbladder, and injudicious use of cautery inside of the triangle of calot. Risk factors that increase the risk of CBD injury include acute cholecystitis, aberrant anatomy. The most common anatomic variant is an aberrant right hepatic duct.

PREVENTION:

i) use a 30 degree laparoscope and high-quality imaging equipment.

ii) Apply firm cephalic traction to the fundus and lateral traction to the infundibulum so that the cystic duct is perpendicular to the CBD.

iii) Dissect the cystic duct where it joins the gallbladder.

iv) Expose the “critical view of safety” prior to dividing the cystic duct.18

v) Convert to open procedure if the infundibulum cannot be mobilized or bleeding or inflammation obscures the triangle of calot.

vi) Perform routine intraoperative cholangiography. A recent study using an American Medicare database found a reduction in CBD injuries with routine use of Intraoperative Cholangiography (from 0.58% to 0.39%).

g) BOWEL INJURY

Injury to bowel can occur during trocar insertion or dissection in the right upper quadrant, especially when using electrosurgical devices. The jejunum, ileum and colon can be injured by veress needle and trocars while duodenum is likely to be injured during dissection. Any structure fixed to the undersurface of the umbilicus like the urachus or a meckel’s diverticulum is more susceptible to injury during access. The rate of bowel injury between 0 and 0.4% has been reported in various studies. Deziel et al carried out retrospective analysis and found that mortality

rate following all bowel injuries during laparoscopic cholecystectomy was 4.6% while it was 8.3% for duodenal injuries.

h) WOUND INFECTION AND INCISIONAL HERNIA

"The risk of wound infection following laparoscopic cholecystectomy is less than 1% and the risk of incisional hernia is 0.5%. Use of a retrieval bag for extraction of GB and closure of all port sites larger than 8mm may avoid these complications".

i) DIAPHRAGMATIC INJURY

Diaphragmatic injury may be due to either cautery or by mechanical puncture by an instrument while retracting the fundus cranially with excessive force.

j) PNEUMOPERITONEUM RELATED COMPLICATIONS[34]:

"Pneumoperitoneum can cause complications like carbon dioxide embolism, vasovagal reflex, cardiac arrhythmias and hypercapnia induced acidosis.Hypercapnia and acidosis are due to absorption of carbon dioxide from the peritoneal cavity. Sudden increases in Paco2 may be related to port slippage and extraperitoneal or subcutaneous diffusion of CO2. It is managed by desufflating the abdomen for 10 to 15

min. If reinsufflation results in recurrent hypercapnia, then change the insufflations gas or convert to open".

"Carbon dioxide embolism is characterized by unexplained hypotension and hypoxia. Characteristic millwheel murmur is detected on auscultation. This is produced due to the contraction of right ventricle against the blood gas interface. There is an exponential decrease in end tidal CO2 due to complete right ventricular outflow obstruction. It is managed by immediate evacuation of pneumoperitoneum and placement of the patient in left lateral decubitus, head down position. This allows the CO2 bubble to float to the apex of the right ventricle, where it is less likely to cause right ventricular outflow obstruction. Patient is hyperventilated with 100% oxygen".

OPEN CHOLECYSTECTOMY:

INDICATIONS FOR OPEN CHOLECYSTECTOMY[35]:

"i) Poor pulmonary or cardiac reserve

ii) Suspected or known gallbladder cancer

iii) Cirrhosis and portal hypertension

iv) Third-trimester pregnancy

v) Combined procedure

vi) Conversion from laparoscopic approach”

“A kocher’s incision is made which is a short right upper transverse incision centered over the lateral border of the rectus muscle. By placing packs on the hepatic flexure of the colon, the duodenum, and the lesser Omentum to get a clear view of the gallbladder. Using the left hand of the assistant these packs are retracted, or a stabilized ring retractor can be used to keep the pack in position. A duval forceps is placed on the infundibulum of the gallbladder, and the peritoneum overlying calot’s triangle is stretched. The calot’s triangle is dissected to expose the cystic duct and the cystic artery. These are confirmed by tracing them to enter the gallbladder. The cystic artery is ligated and cut. The cystic duct is then ligated and divided. A suction drain is placed before closure”.

“Whenever there is doubt in dissecting calot’s triangle, a fundus first or retrograde cholecystectomy can be helpful by starting the dissection from the fundus dissecting on the gallbladder wall down to the cystic duct”.

ADVANTAGES[34]:

"The advantages of Laparoscopic cholecystectomy over Open cholecystectomy are:

- Less pain
- Smaller incisions
- Less intestinal ileus
- Shorter Hospital stay
- Better cosmesis
- Earlier return to normal activity"

DISADVANTAGES[34]:

"The disadvantages of Laparoscopic cholecystectomy are:

- Lack of depth perception
- Adhesions/Inflammation limit its use
- More difficult to control haemorrhage
- Potential CO2 insufflation complications
- Decreased tactile discriminations"

CONTRAINDICATIONS[34]:

ABSOLUTE:

"The absolute contraindications of Laparoscopic cholecystectomy are:

- Unable to tolerate general anaesthesia
- Refractory coagulopathy
- Suspicion of Gall bladder carcinoma

RELATIVE:

There are certain relative contraindications such as:

- Previous upper abdominal surgery
- Cholangitis
- Diffuse peritonitis
- Chronic obstructive pulmonary disease
- Morbid obesity
- Pregnancy
- Cirrhosis and Portal hypertension"

PATIENTS LIKELY TO REQUIRE CONVERSION

a) Multiple prior operations - due to difficulty in safe access to peritoneal cavity.

b) Acute severe cholecystitis: Due to difficult dissection secondary to inflammation, adhesions or oedema.

c) Acute pancreatitis: Difficult visualization of calot's triangle due to oedematous pancreatic head.

d) Abnormal anatomy: Higher likelihood of biliary/vascular injury.

e) Cirrhotic liver: Higher likelihood of liver injury and haemorrhage.

f) Third trimester pregnancy: Higher likelihood of uterine injury during access.

g) Morbid obesity: Difficulty in access and dissection.

h) Evidence of generalized peritonitis.

i) Septic shock from cholangitis.

LITRATURES

1. USG abdomen is an extremely useful and accurate method for identifying gallstones and pathologic changes in the GB consistant with acute cholecystitis . USG of andomen has a high specificity of >98%, and sensitivity of >95% in diagnosing cholelithiasis.

2. Syed amjid ali rizvi et al demonstrated that most valuble assessment that USG can provide is GB wall thickness , GB size , CBD size , amy abnormal anatomy of biliary tract , if present

3. Jeremy lipman et al demonstrated that significant independent predictive factors for conversion of laparoscopic cholecystectomy to open cholecystectomy are male gender , previous abdominal surgeries, acute cholecystitis thickened GB wall on pre operative USG of abdomen and suspicion of CBD stones.

4. Conversion rate in laparoscopic cholecystectomy is 1.5 to 19 % , however simopoulos et al classified conversion rate for acute cholecystitis based on GB pathology as follows – 14% a for acute oedematous cholecystitis , 15.5% for hydrops , 25.8 % for GB empyema .

5. First described in 1882 by lagenbuch , open cholecystectomy has been the primary treatment gall stone diseases for most of the past century

6. In 1985 , the first documented laparoscopic cholecystectomy was performed by ERICH MUHE in GERMANY in 1985, in 1987 , PHILIPE MOURET , perform the first laparoscopic cholecystectomy in LYONS , FRANCE using video technique .

7. A difficult laparoscopic cholecystectomy that requires conversion to open procedure can be predicted by pre operative ultrasonography ., pawan lal, md, pn agarwal md, and al chakravarthi, md JSLS 2002.,ncbi,nlm.nih.gov . Results were pre operative USG abdomen good predictor of difficulty in lap cholecystectomy

8. Risk factors resulting in conversion of laparoscopic cholecystectomy to open surgery , N.A.kama, mdoganay , m dolapci, e,reis, m.atli, m .kologlu. surgical endocopy, September 2001, volume 15, issue 9 ,pp 965-968., Results the most common reason for conversion was inability to defined anatomy patients with inflamed GB, male gender, previous abdominal surgery, thickened GB wall on pre op USG and suspicion of CBD stones

9. The role of pre operative investigations in predicting difficult laparoscopic cholecystectomies., surgical endoscopy , august 1996, volume 10,issue 8 , pp 791-793 ., results USG findings relate to difficulty of lap procedure more closely than the other pre operative investigations

10. A comprehensive predictive scoring method for difficult laparoscopic cholecystectomy . journal of minimal access surgery. By makm vivek 2014, www.ncbi,nlm .nih.gov. results this sudy demonstrate that a scoring system predicting the difficulty in laparoscopic is feasible .

11. USG in GB disease prediction of difficult laparoscopic cholecystectomy., IJSR,ISSN ONLINE : 2319-7064, IMPACT FATOR 2012: 3.358 , results USG is good predictor of difficult laparoscopic cholecystectomy

12. Prediction of difficulty of laparoscopic cholecystectomy by pre operative USG : a randomized control trail , global journal inc, (USA), online ISSN 229-4618, thick GB wall is a finding which may show that more adhesions may be found in surgery, reason for conversion dense adhesions and bleeding from cystic artery.

MATERIALS AND METHODS

MATERIALS AND METHODS

A total of 50 cases with gallstones admitted in RGGGH during the period from January 2015 to September 2015 and planned for Laparoscopic cholecystectomy were analysed in this study. They were subjected to a detailed history, clinical examination and then to blood investigations and radiological investigations. Their Name, Age, Sex, and findings of USGof Abdomen were recorded. All these patients were subjected to Laparoscopic cholecystectomy .the laparoscopic surgery was performed by surgeons at our unit experienced in laparoscopic surgery, therefore , the learning curve statistics do not apply to this study, the operating surgeon was blinded to these findings ,the operative findings were objectively graded as difficult or easy laparoscopic cholecystectomy from insertion of the veress needle or trocar until the extraction of the gall bladder was considered a difficult laparoscopic cholecstectomy, tear of GB, spillage of bile and stones considered a difficult procedure , > 30 minutes taken to dissect GB from GB bed was considered a difficult procedure , > 20 minutes taken to dissect calots triangle was considered difficult procedure,any laparoscopic cholecystectomy converted to the open procedure was considered a difficult laparoscopic cholecystectomy.

INCLUSION CRITERIA:

- The patients presenting with symptom and sign of cholelithiasis/ diagnosed by ultrasound abdomen.
- Age 20 -70 yrs

EXCLUSION CRITERIA:

- Patients below 20yrs age
- Previous abdominal surgery
- Patients with CBD calculus, raised ALP , dilated CBD, where CBD exploration needed.
- Patients with features of obstructive jaundice
- Suspected malignant gall bladder disease
- Patient medically unfit for laparoscopic

EQUIPMENTS REQUIRED FOR LAPAROSCOPIC CHOLECYSTECTOSMY:

a) High-quality videoscope with a 300 w light source be coupled to two high resolution monitors.

b) High-flow carbon dioxide insufflator.

c) Four trocars: 2-10 mm trocars and 2-5 mm trocars.

d) Hand instruments: Monopolar electrode c-hook with suction and irrigation, a fine tipped dissector, two gallbladder grasper, a large gallbladder extractor, a pair of scissors and a medium to large hemoclip applier.

e) 10 mm stone retrieval grasper.

ULTRASOUND SCORING

		1	**2**	**3**	**4**
1	GB status	normal	Contracted	distended	
2	GB wall thickness	<3mm	>3mm		
3	Number of stones	Single	multiple		
4	Pericholcystic collection	no			yes
5	Stonesize	<5mm	5mm- 1cm	>1cm	

RESULTS

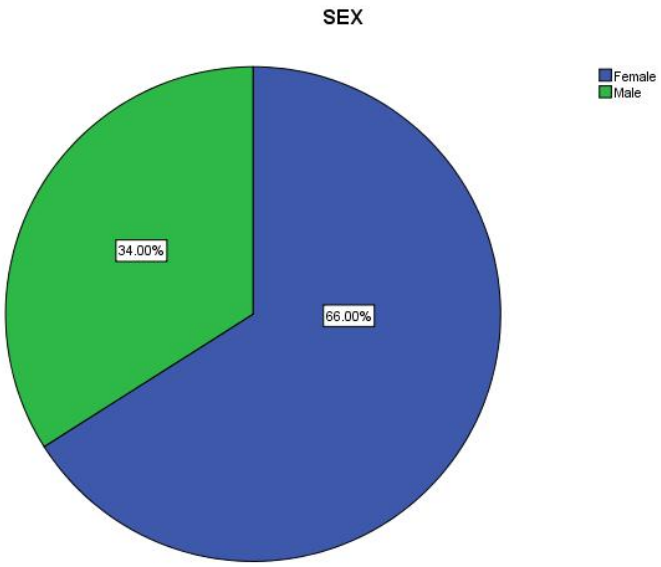
RESULTS

AGE DISTRIBUTION:

A total of 50 patients with clinical and ultrasonographic evidence of gallstones admitted in our hospital were analysed in this study.Of these there were 33 females and 17 males

SEX

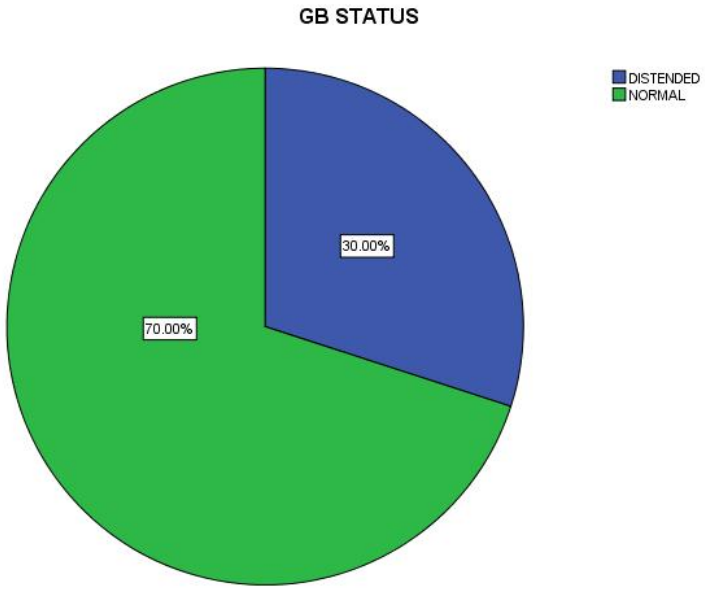
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	F	33	66.0	66.0	66.0
	M	17	34.0	34.0	100.0
	Total	**50**	**100.0**	**100.0**	



GB STATUS :

GB STATUS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DISTENDED	15	30.0	30.0	30.0
	NORMAL	35	70.0	70.0	100.0
	Total	**50**	**100.0**	**100.0**	

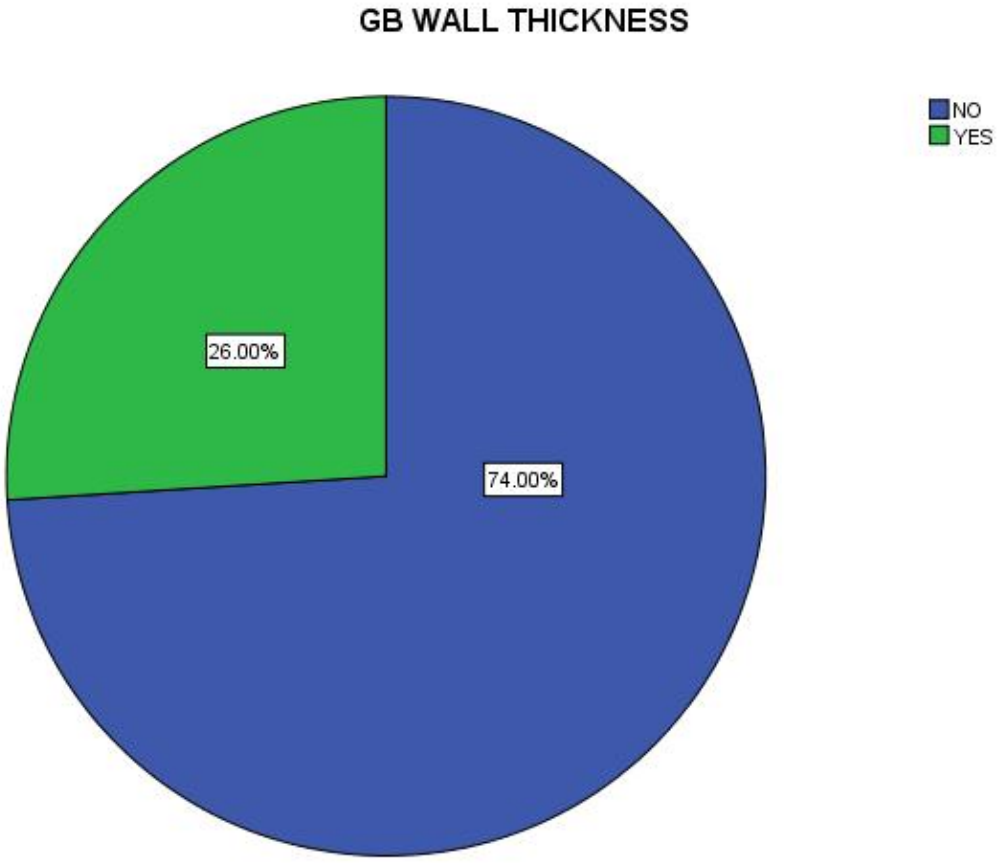


The GB according to ultrasound was found to be distended in 30% of cases and normal in the remaining 70% of cases

GB WALL THICKNESS

GB WALL THICKNESS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	37	74.0	74.0	74.0
	YES	13	26.0	26.0	100.0
	Total	**50**	**100.0**	**100.0**	

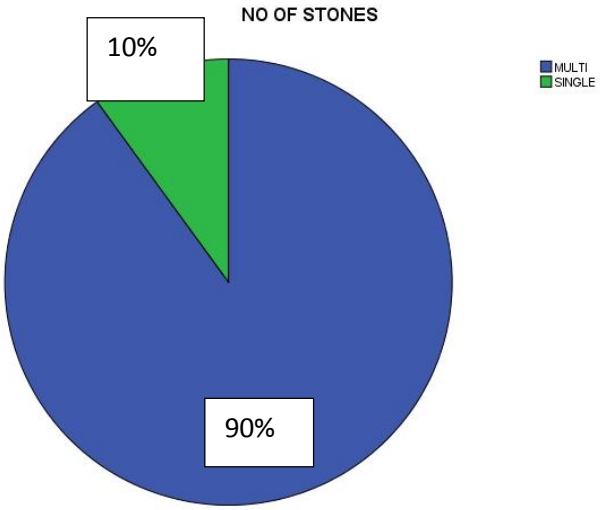


NO OF STONES :

The ultrasound showed multiple stones in 90% of cases and single stones were found in 10% of cases

NO OF STONES

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	MULTI	45	90.0	90.0	90.0
	SINGLE	5	10.0	10.0	100.0
	Total	**50**	**100.0**	**100.0**	

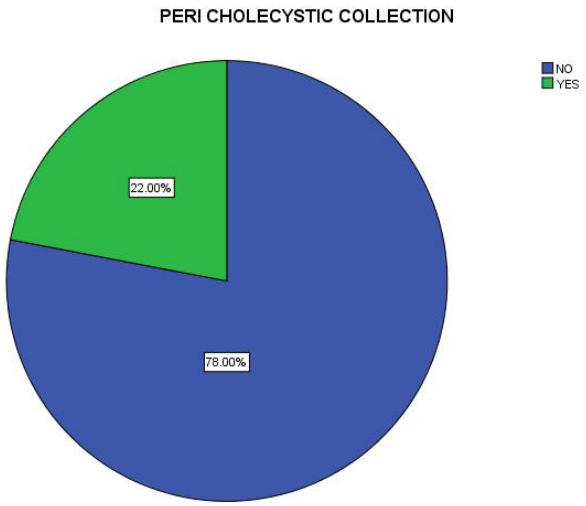


PERI CHOLECYSTIC COLLECTION

Pericholecystic collections were found in 22% of cases and it was not found in 78% of cases

PERI CHOLECYSTIC COLLECTION

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NO	39	78.0	78.0	78.0
	YES	11	22.0	22.0	100.0
	Total	**50**	**100.0**	**100.0**	

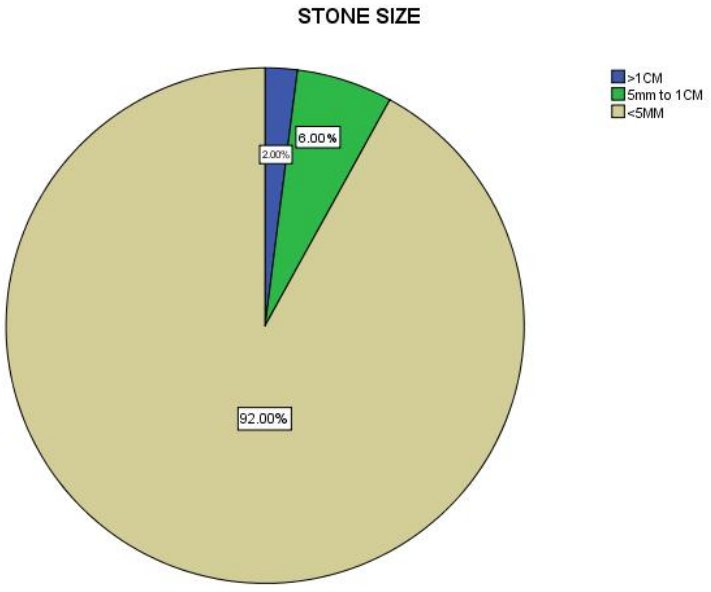


STONE SIZE

The stones were found to be <5mm in 92% of cases , found to be within 5mm and 1 cm in 6% of cases and >1 cm in 2% of cases

STONE SIZE

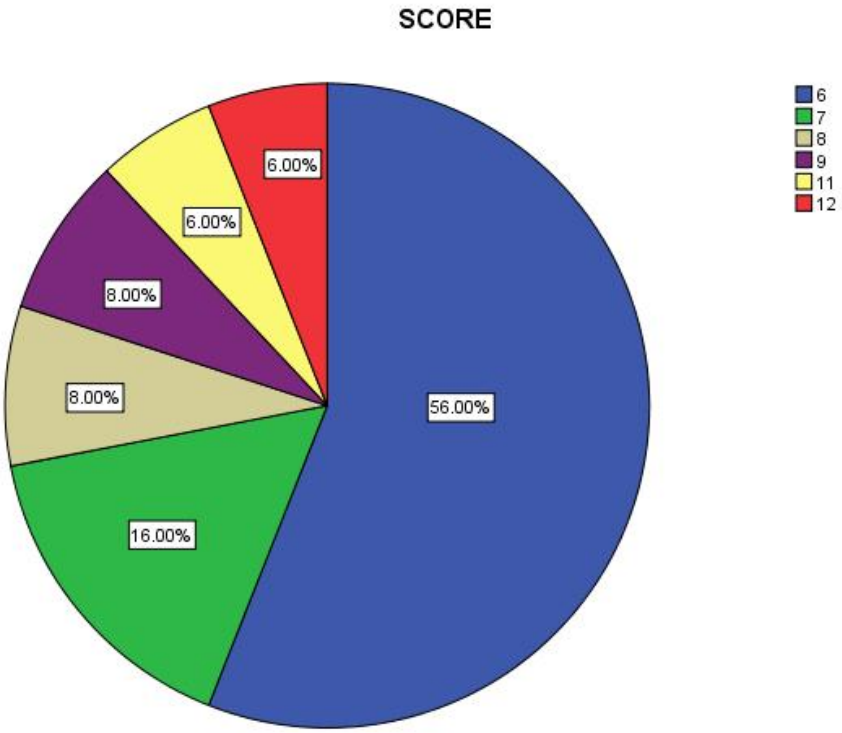
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	>1cm	1	2.0	2.0	2.0
	5mm to 1 cm	3	6.0	6.0	8.0
	<5MM	46	92.0	92.0	100.0
	Total	**50**	**100.0**	**100.0**	



SCORE

SCORE

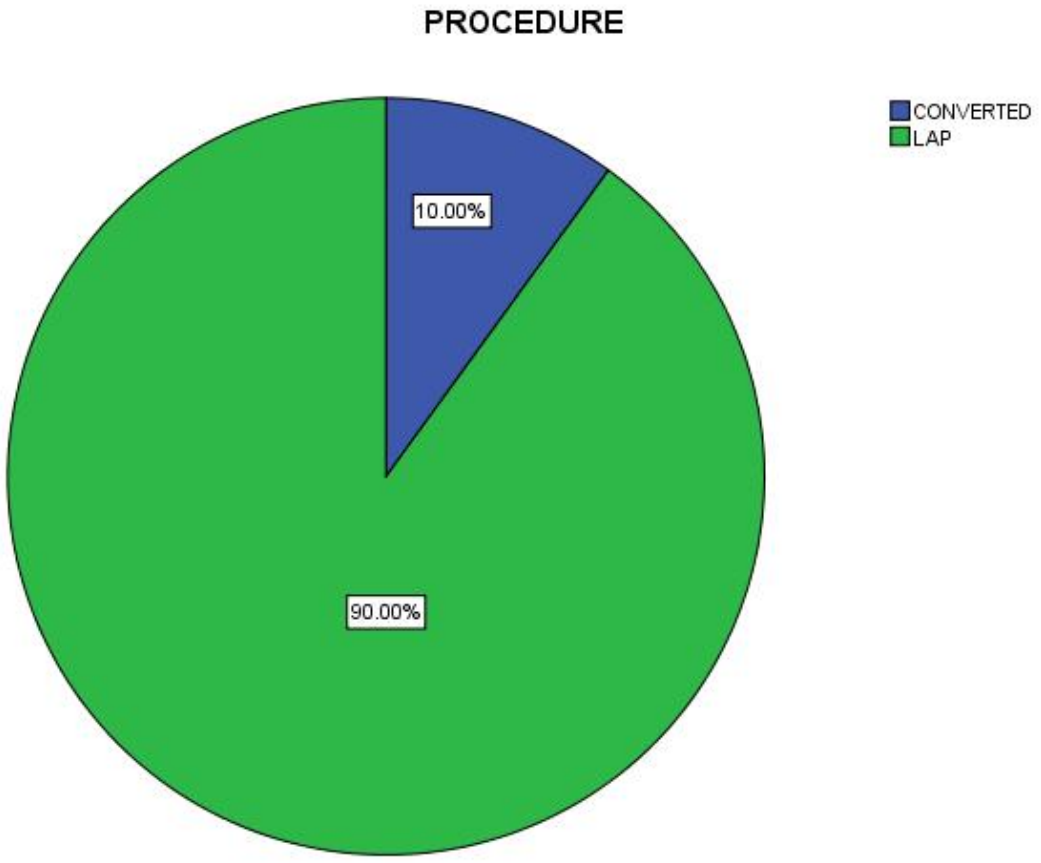
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6	28	56.0	56.0	56.0
	7	8	16.0	16.0	72.0
	8	4	8.0	8.0	80.0
	9	4	8.0	8.0	88.0
	11	3	6.0	6.0	94.0
	12	3	6.0	6.0	100.0
	Total	**50**	**100.0**	**100.0**	



PROCEDURE

PROCEDURE

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid CONVERTED	5	10.0	10.0	10.0
LAP	45	90.0	90.0	100.0
Total	**50**	**100.0**	**100.0**	



Crosstab

Count

		PROCEDURE		
		CONVERTED	LAP	Total
GB STATUS	DISTENDED	5	10	15
	NORMAL	0	35	35
Total		5	45	50

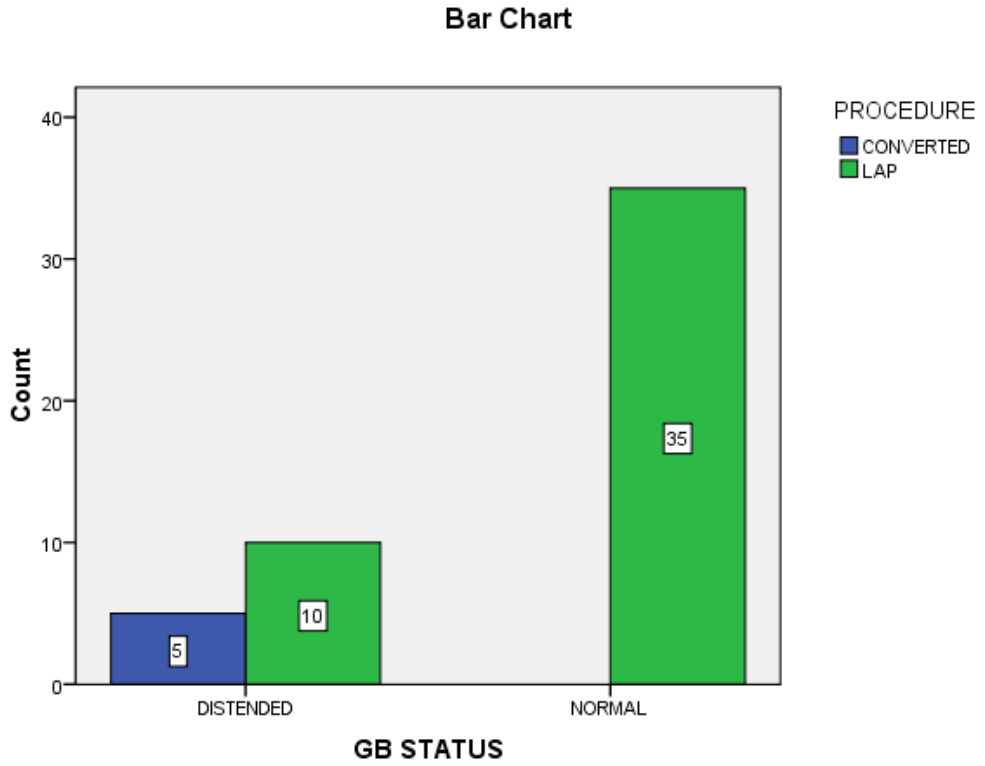
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.963[a]	1	.000		
Continuity Correction[b]	9.524	1	.002		
Likelihood Ratio	13.413	1	.000		
Fisher's Exact Test				.001	.001
McNemar Test				.002[c]	
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.50.

b. Computed only for a 2x2 table

c. Binomial distribution used.



It was found that of the 35 cases in which the GB status was normal, it was possible to do the surgery in laparoscopy itself . of the remaining 15 cases in which GB was distended, 5 cases were converted to open. The statistical analysis also shows this difference to be significant with a p value of .001

Crosstab

Count

		PROCEDURE		
		CONVERTED	**LAP**	**Total**
GB WALL THICKNESS	<3 mm	0	37	37
	>3mm	5	8	13
Total		**5**	**45**	**50**

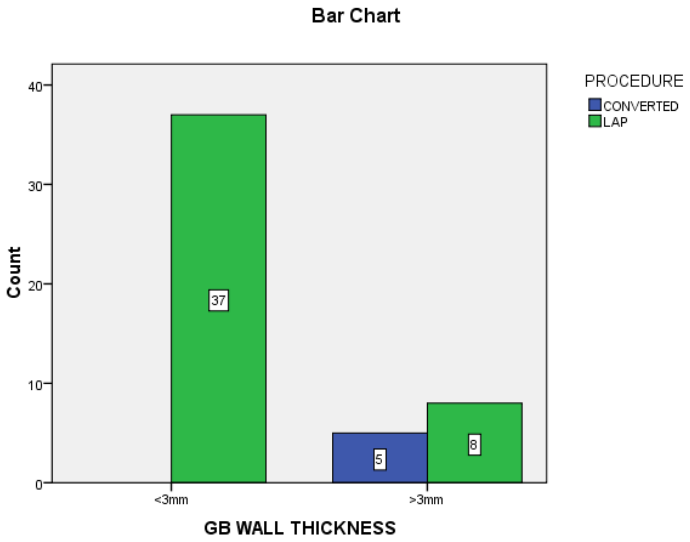
Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	15.812[a]	1	.000		
Continuity Correction[b]	11.827	1	.001		
Likelihood Ratio	15.185	1	.000		
Fisher's Exact Test				.001	.001
McNemar Test				.[c]	
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.30.

b. Computed only for a 2x2 table

c. Both variables must have identical values of categories.



It was found that of the 37 cases in which the GB wall thickness was <3mm, it was possible to do the surgery in laparoscopy itself . of the remaining 13 cases in which GB was thickened , 5 cases were converted to open. The statistical analysis also shows this difference to be significant with a p value of .001

Crosstab

Count

		PROCEDURE		
		CONVERTED	**LAP**	**Total**
NO OF STONES	MULTI	4	41	45
	SINGLE	1	4	5
Total		**5**	**45**	**50**

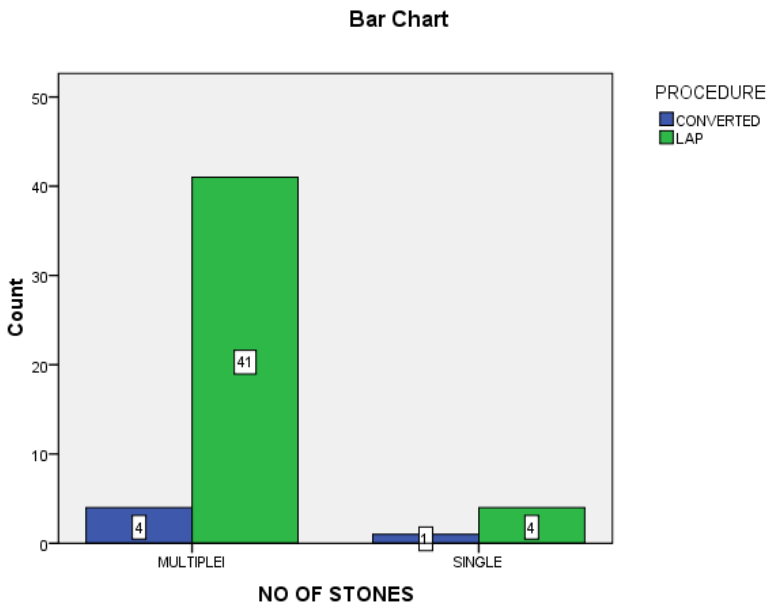
Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	.617[a]	1	.432		
Continuity Correction[b]	.000	1	1.000		
Likelihood Ratio	.508	1	.476		
Fisher's Exact Test				.423	.423
McNemar Test				.[c]	
N of Valid Cases	50				

a. 3 cells (75.0%) have expected count less than 5. The minimum expected count is .50.

b. Computed only for a 2x2 table

c. Both variables must have identical values of categories.



It was found that of the 45 cases in which the multiple stones were found, 4 cases were converted .of the remaining 5 cases in which single stones were found , 1 cases were converted to open. The statistical analysis also shows this difference to be significant with a p value of .423. This suggests that in this study number of stones alone is not a significant factor to predict conversion into open.

Crosstab

Count

		PROCEDURE		
		CONVERTED	**LAP**	**Total**
PERI CHOLECYSTIC COLLECTION	NO	0	39	39
	YES	5	6	11
Total		**5**	**45**	**50**

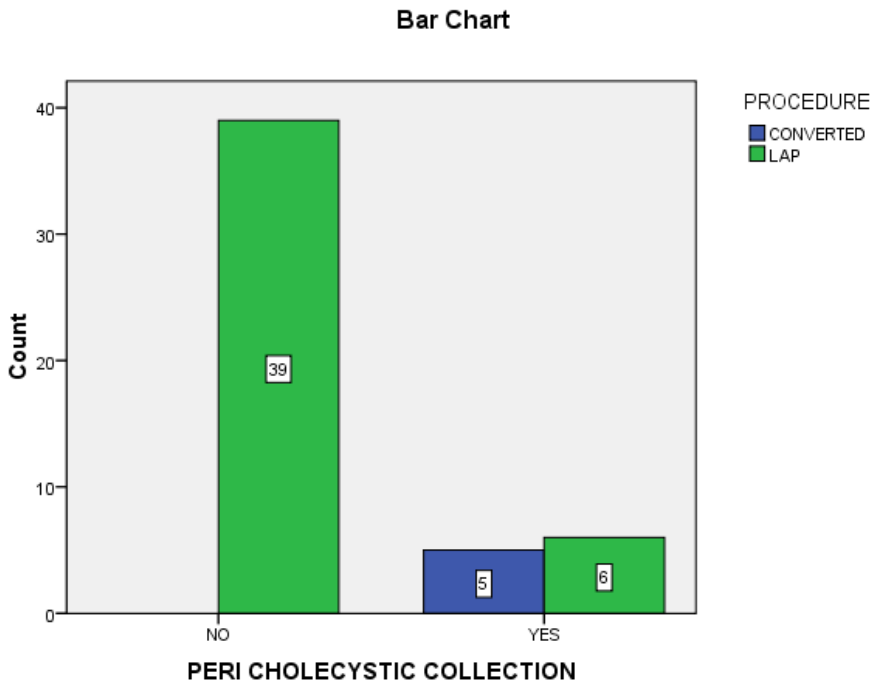
Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**	**Exact Sig. (2-sided)**	**Exact Sig. (1-sided)**
Pearson Chi-Square	19.697[a]	1	.001		
Continuity Correction[b]	14.970	1	.001		
Likelihood Ratio	17.350	1	.001		
Fisher's Exact Test				.001	.001
McNemar Test				.[c]	
N of Valid Cases	50				

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.10.

b. Computed only for a 2x2 table

c. Both variables must have identical values of categories.



It was found that of the 39 cases in which pericolecystic collection was not there , it was possible to do the surgery in laparoscopy itself . of the remaining 11 cases had pericholecystic collection , 5 cases were converted to open. The stastistical analysis also shows this difference to be significant with a p value of .001

Crosstab

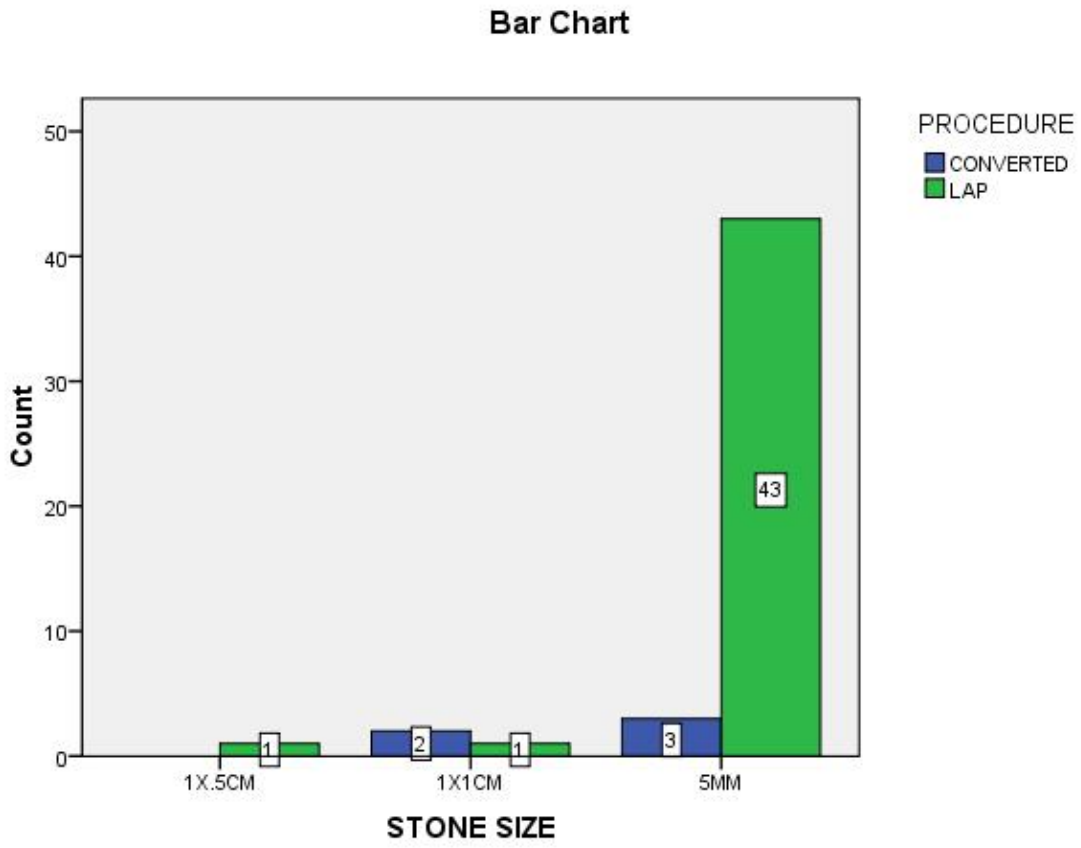
Count

		PROCEDURE		
		CONVERTED	LAP	Total
STONE SIZE	1X.5CM	0	1	1
	1X1 CM	0	1	1
	1X1CM	2	0	2
	5MM	3	43	46
Total		5	45	50

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	11.433[a]	2	.003
Likelihood Ratio	6.509	2	.039
N of Valid Cases	50		

a. 5 cells (83.3%) have expected count less than 5. The minimum expected count is .10.



It was found that of the 46 cases in which stones were <5mm , 3 cases were converted . of the 3 cases in which stones were between 5mm and 1 cm , 2 cases were converted to open. The one case with a stone more than 1 cm was done by laparoscopy , The statistical analysis also shows this difference to be significant with a p value of .003

Crosstab

Count

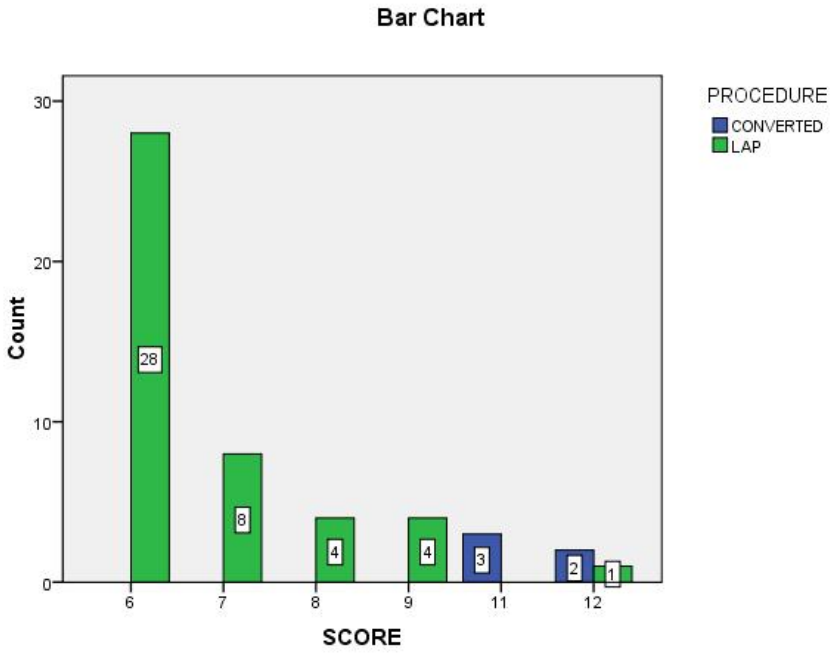
		PROCEDURE		
		CONVERTED	**LAP**	**Total**
SCORE	6	0	28	28
	7	0	8	8
	8	0	4	4
	9	0	4	4
	11	3	0	3
	12	2	1	3
Total		**5**	**45**	**50**

Chi-Square Tests

	Value	**df**	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	42.593[a]	5	.001
Likelihood Ratio	28.689	5	.001
McNemar-Bowker Test	.	.	.[b]
N of Valid Cases	50		

a. 10 cells (83.3%) have expected count less than 5. The minimum expected count is .30.

b. Computed only for a PxP table, where P must be greater than 1.



It can be noted that as the score increases the chance of the case being opened increases and all the opened cases had score of either 11(3 cases) or 12(2 cases). The statistical analysis also shows the difference to be significant with a p value of .001

DISCUSSION

DISCUSSION

Laparoscopic cholecystectomy has become the gold standard treatment for patients with gallstones due to less morbidity, lesser hospital stay and early return to normal activities. The difficult gallbladder is the most common 'difficult' laparoscopic surgery being performed by general surgeons all over the world and the potential one that places the patient at significant risk[12]. Previous reports have promulgated the use of scoring systems to predict conversion to open cholecystectomy. However, these systems presented incongruent data points, evaluated a limited number of factors, included subjective variables, and some were formulated early in the course of laparoscopic cholecystectomy before the operation became uniformly established[16]. So we planned to analyse USG factors to predict the conversion of laparoscopic cholecystectomy to open cholecystectomy.

In our study, 50 patients diagnosed with gallstones were taken for Laparoscopic cholecystectomy. Among the 50 patients, 33 patients(i.e. 66%) were female and 17 patients (i.e. 34%) were male. Of the 50 patients, 5 patients were converted to open cholecystectomy.

GB status

It was found that of the 35 cases in which the GB status was normal , it was possible to do surgery in laparoscopic itself , of the remaining 15 cases in which GB was distended , 5 cases were converted to open , the statistical analysis also shows this difference to be significant with a p value of 0.001

GB wall thickness

It was found 37 cases with GB wall thickness was <3mm possible to do laparoscopic itself , remaining 13 cases GB wall thickness was > 3mm , of which 5 cases were converted to open, the statistical analysis also shows this difference to be significant with a p value of 0.001

Number of stones

it was found 45 casesin which the multiple stones found, 4 cases were converted, of the remaining 5 cases in which single stones were found, 1 cases were converted to open, the statistical analysis also shows this difference to be significant with a pvalue of 0.423 this suggest that in this study number of stones alone is not a significant factor to predict conversion to open

Pericholecystic collection

It was found that of the 39cases in which pericholecystic collection was not there , it was possible to do the surgery in laparoscopic itself.

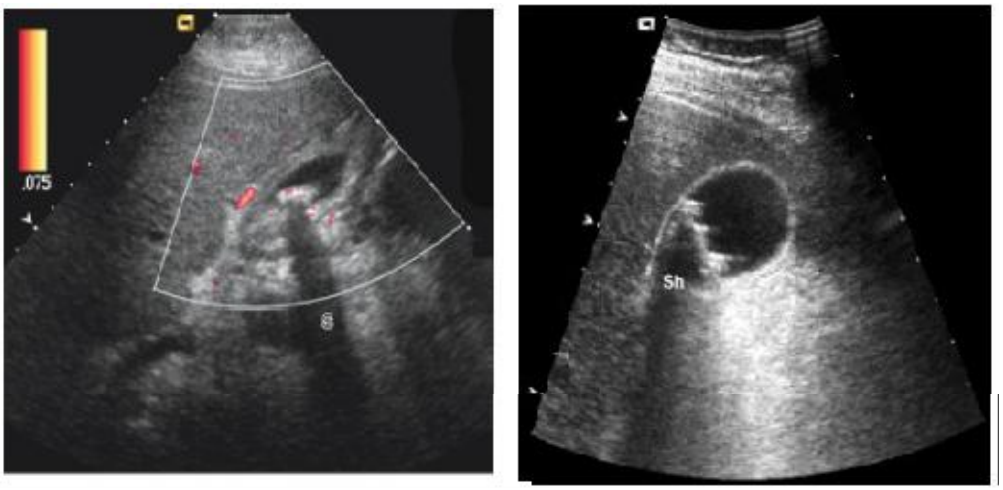
Of the remaining 11 cases had pericholecystic collection , of which 5 cases were converted to open The statistical analysis also shows this difference to be significant with a P value of 0.001.

Stone size

It was found that of the 46 cases in which stones were <5mm, 3 cases were converted.

Of the 3 cases in which stones were between 5mm and 1 cm, 2 cases converted to open.

The one case with a stone more than 1 cm was done by laparoscopy , the statistical analysis also shows this difference to be significant with a P value of 0.003



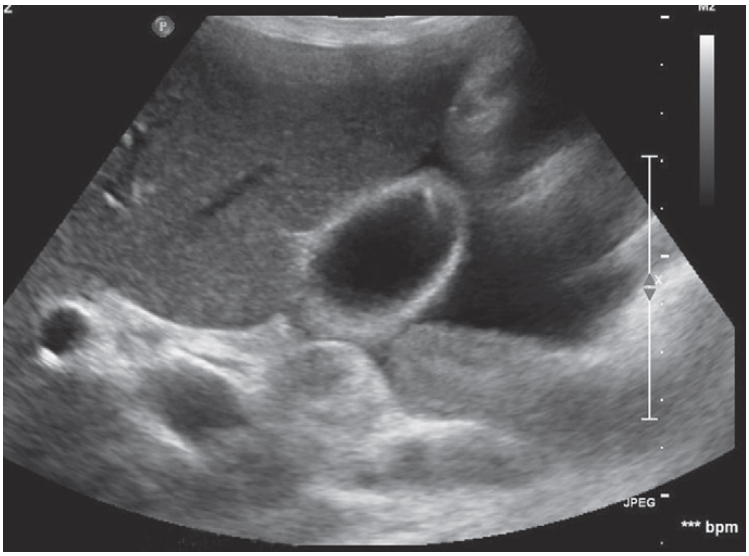
A, Echogenic foci in the gallbladder with acoustic shadowing (S) are characteristic of gallstones. In this patient, the gallbladder wall is thickened.. Features suggest chronic cholecystitis. B, Multiple stones are layered in the dependent portion of the gallbladder, but the wall is not thickened.

Gallbladder wall thickness more than 3mm was found to be a risk factor for conversion in many studies. Hutchinson et al(2008), Liu et al considered gallbladder wall thickness to be the most important sonographic risk factor for conversion to open cholecystectomy.

Gallbladder wall thickness is related to the inflammation or fibrosis that follows previous attacks of cholecystitis and thus may reflect difficulty in delineation of anatomy during surgery. Similarly prolonged operating time was demonstrated in patients with Gallbladder wall thickness of more than 3mm.

This may be due to difficulty during grasping the gallbladder, difficult Gallbladder bed dissection and higher incidence of bleeding[20]. Our study also demonstrated that increased Gallbladder wall thickness is associated with increased risk of conversion to open cholecystectomy.

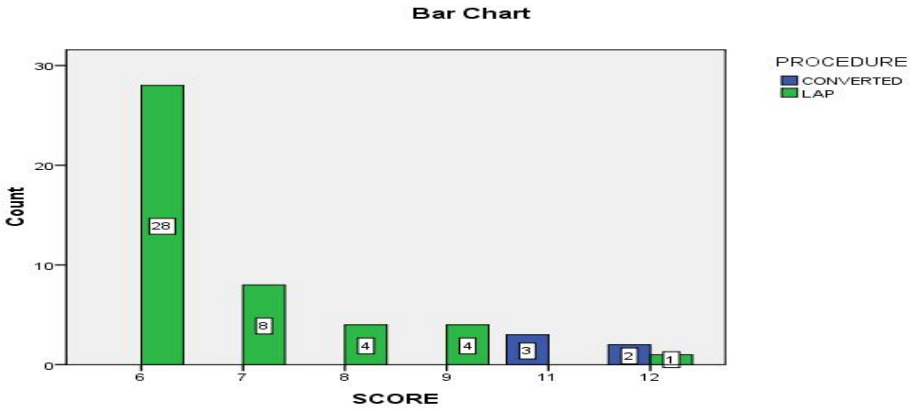
ULTRASOUND ABDOMEN SHOWING THICKENED GALLBLADDER WALL



Many studies have considered gallbladder thickness as a significant risk factor for conversion to open cholecystectomy. In our study also it was found that increased gallbladder wall thickness of more than 3mm was associated with increased risk of conversion to open cholecystectomy.

The presence of pericholecystic collection renders the dissection of calot's triangle difficult and increased chances of conversion to open

cholecystectomy[11] .



In our study we analysed USG factors such as GB status, GB wall thickness, number of stones, pericholecystic collection, size of stone as the USG score increases the chance of the case being opened increases and all the opened cases had either 11 0r 12 ,

The statistical analysis also shows the difference to be significant with a p value of 0.001

CONCLUSION

CONCLUSION

Laparoscopic cholecystectomy has gradually replaced open cholecystectomy in the treatment of patients with benign gallbladder disease. With the advancement in equipment and experience in laparoscopic surgery, most of the difficult gallbladder can be dealt laparoscopically.

Preoperative USG examination of the GB is a good predictor of difficult cholecystectomy in majority of cases and should be used pre operatively as a routine screening tool to delineate biliary tree anatomy and pathology, pre operative risk factor can help to predict difficult gallbladder and conversion to other type of cholecystectomy.

In our study we analysed USG factors such as GB status, GB wall thickness, number of stones, pericholecystic collection, size of stone.

In our study noted that as the USG score increases the chance of the case being opened increases and all the opened cases had either 11 0r 12, The statistical analysis also shows the difference to be significant with a p value of 0.001

Among USG factors, a distended GB, increased GB wall thickness, presence of pericholecystic collection ,large size of stone

proved to be significant and was associated with increased risk of conversion to open cholecystectomy.

Our results demonstrate that an a accurate and easily derived estimation of risk factor predicting conversion from laparoscopic cholecystectomy to open cholecystectomy can be obtained from USG score , increase in score can predict difficulty to be encountered during laparoscopic cholecystectomy and help in making a decision for conversion thus shortening the duration of surgery thereby preventing unnecessary complications.

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BIBLIOGRAPHY

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ANNEXURES

S. NO	NAME	AGE	SEX	IP NO	GB STATUS	GB WALL THICKNESS	NO OF STONES	PERI CHOLECYSTIC COLLECTION	STONE SIZE	SCORE	PROCEDURE
1	PUNITHA	37	F	13179	NORMAL	YES	MULTI	NO	5MM	7	LAP
2	VENUGOPAL	62	M	16356	NORMAL	NO	MULTI	NO	5MM	6	LAP
3	SHANMUGAPRIYA	35	F	21446	NORMAL	NO	MULTI	NO	5MM	6	LAP
4	MURUGESAN	68	M	21800	DISTENDED	YES	MULTI	YES	5MM	12	CONVERTED
5	VAGEETHABANU	35	F	27132	NORMAL	NO	MULTI	NO	5MM	6	LAP
6	KUPPU	48	F	27101	DISTENDED	NO	MULTI	NO	5MM	7	LAP
7	SARALA	31	F	41431	DISTENDED	YES	SINGLE	YES	1X1CM	11	CONVERTED
8	GAYATHRI DEVI	42	F	43530	NORMAL	YES	MULTI	NO	5MM	7	LAP
9	SHANTHA	66	F	42742	NORMAL	YES	MULTI	NO	5MM	7	LAP
10	SHABEERA	30	F	49451	DISTENDED	YES	MULTI	YES	1X1CM	12	CONVERTED
11	SUDHA	39	F	48636	NORMAL	NO	MULTI	NO	5MM	6	LAP
12	FEROZBEGAM	28	F	51127	NORMAL	NO	MULTI	NO	5MM	6	LAP
13	POMPIRAI	35	F	53425	DISTENDED	YES	MULTI	YES	5MM	12	LAP
14	UMAVATHY	53	F	53834	DISTENDED	NO	MULTI	NO	5MM	7	LAP
15	GUNASEKAR	57	M	57037	DISTENDED	YES	MULTI	YES	5MM	11	CONVERTED
16	THIYAGARAJAN	31	M	56659	NORMAL	NO	MULTI	NO	5MM	6	LAP
17	LAKSHMI	45	F	59257	NORMAL	NO	MULTI	NO	5MM	6	LAP
18	SUBRAMANI	45	M	59233	NORMAL	NO	MULTI	NO	5MM	6	LAP
19	NAGALAKSHMI	42	F	59256	NORMAL	NO	MULTI	NO	5MM	6	LAP
20	YASHODA	39	F	62038	NORMAL	NO	MULTI	NO	5MM	6	LAP
21	MULLAI	33	F	62219	NORMAL	NO	MULTI	NO	5MM	6	LAP
22	SHANTHI	44	F	75868	DISTENDED	YES	MULTI	NO	5MM	7	LAP
23	SENTHIL KUMAR	35	M	81102	NORMAL	NO	MULTI	NO	5MM	6	LAP
24	SHEIK MANSOOR	39	M	81280	NORMAL	NO	MULTI	NO	5MM	6	LAP
25	GANAVEL	21	M	73181	NORMAL	NO	MULTI	NO	5MM	6	LAP
26	YUVARAJ	45	M	86461	NORMAL	NO	MULTI	NO	5MM	6	LAP
27	LAKSHMI	33	F	83751	NORMAL	NO	MULTI	NO	5MM	6	LAP
28	DEVI	25	F	85328	NORMAL	NO	MULTI	NO	5MM	6	LAP
29	GOWRI	52	F	8952	NORMAL	NO	MULTI	NO	5MM	6	LAP
30	PAVITHRA	30	F	1157	NORMAL	NO	MULTI	YES	5MM	9	LAP
31	SARASWATHI	47	F	127830	NORMAL	NO	MULTI	NO	5MM	6	LAP
32	MUNIYAMMAL	40	M	118754	NORMAL	NO	MULTI	NO	5MM	6	LAP
33	KANNIYAMMAL	35	F	110784	DISTENDED	YES	MULTI	NO	5MM	8	LAP
34	RANI	29	F	110082	NORMAL	NO	MULTI	NO	5MM	6	LAP
35	ANUSHYA	34	F	100768	DISTENDED	YES	MULTI	NO	5MM	8	LAP
36	RANGANATHAN	64	M	107871	DISTENDED	NO	SINGLE	YES	5MM	9	LAP
37	KEERTHANA	42	F	103072	NORMAL	NO	MULTI	NO	5MM	6	LAP

S. NO	NAME	AGE	SEX	IP NO	GB STATUS	GB WALL THICKNESS	NO OF STONES	PERI CHOLECYSTIC COLLECTION	STONE SIZE	SCORE	PROCEDURE
38	DHANALAKSHMI	20	F	100768	NORMAL	NO	MULTI	NO	5MM	6	LAP
39	MASILAMANI	60	M	90285	DISTENDED	YES	MULTI	YES	5MM	11	CONVERTED
40	YASHODA	60	F	91326	NORMAL	NO	MULTI	YES	5MM	9	LAP
41	SHOBA	40	F	75091	DISTENDED	NO	SINGLE	NO	1X.5CM	7	LAP
42	TAMILMANI	22	F	83095	NORMAL	NO	MULTI	NO	5MM	6	LAP
43	CHINNAYA	68	M	69943	NORMAL	NO	MULTI	NO	5MM	6	LAP
44	VEERARAGAVAN	45	M	63772	NORMAL	NO	MULTI	NO	5MM	6	LAP
45	MALARKODI	29	F	72432	DISTENDED	NO	MULTI	NO	5MM	7	LAP
46	MUTHUPANDI	30	M	77736	NORMAL	NO	SINGLE	YES	5MM	8	LAP
47	GOVINDAMMAL	35	M	75050	NORMAL	NO	MULTI	NO	5MM	6	LAP
48	ARUMUGAM	35	M	72411	NORMAL	NO	MULTI	YES	5MM	9	LAP
49	OYYAMALAI	50	F	67242	NORMAL	NO	MULTI	NO	5MM	6	LAP
50	SAROJA	60	F	91289	DISTENDED	YES	SINGLE	NO	1X1CM	8	LAP

ABBEREVIATIONS

GB - gall bladder

CBD - common bile duct

LAP - laparoscopic

USG - ultrasonogram

LFT - liver function test

INFORMATION SHEET

TITLE : **"A STUDY ON ULTRA SOUND SCORING PREDICTTING CONVERSION FROM LAP TO OPEN CHOLECYSTECTOMY "**

Name of Investigator : Dr.D.JEGADHES KUMAR. Name of Participant :

Purpose of Research : The purpose of the study is the role of radiological factors predicting difficult laparoscopic cholecystectomy

S**tudy Design :**Prospective Observational Study

Study Procedures : Patient will be subjected to routine investigations & USG ABDOMEN. The patients are then, if willing undergo surgical treatment.

Possible Risks : No risks to the patient

Possible benefits to the patient : Patient is provided an alternative modality of treatment which will help in remission of their disease.

To doctor & to other people : If this study gives positive results, it can help determine the most effective treatment and the treatment protocol for patients with chronic right lower quadrant pain. This will help in providing better and complete treatment to other patients in future.

Confidentiality of the information obtained from you : The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared

Can you decide to stop participating in the study : Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time

How will your decision to not participate in the study affect you : Your decision will not result in any loss of benefits to which you are otherwise entitled.

Signature of Investigator Signature of Participant

Date :

Place :

PATIENT CONSENT FORM

Study Detail : **"A STUDY ON ULTRA SOUND SCORING PREDICTTING CONVERSION FROM LAPAROSCOPIC TO OPEN CHOLECYSTECTOMY "**

Study Centre : Rajiv Gandhi Government General Hospital, Chennai.

Patient's Name :

Patient's Age :

In Patient Number :

Patient may check (☑) these boxes

I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction. ☐

I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected. ☐

I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that ☐

arise from this study.

I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well being or any unexpected or unusual symptoms. ☐

I hereby consent to participate in this study ☐

I hereby give permission to undergo complete clinical examination and diagnostic tests including hematological, biochemical, radiological tests and to undergo treatment ☐

Signature/thumb impression	Signature of Investigator
Patient's Name and Address:	Study Investigator's Name: **Dr.D.JEGADHES KUMAR.,**

QUESTIONAIRE

PATIENT DETAILS:

Name: Age: Sex:

IP No. :

ON ADMISSION:

Main Complaints :

Duration of Complaints :

Co – Morbid Illness :

Significant Past History :

CLINICAL EXAMINATION:

Pulse : BP :

RR : Temp :

Pallor : Icterus :

CVS : RS :

P/A :

INVESTIGATIONS :

CBC: RFT:

Liver Function Test : Ultra sound abdomen:

TREATMENT;

INTRAOPFINDINGS

Turnitin Originality Report

thesis by Jegadhes kumar

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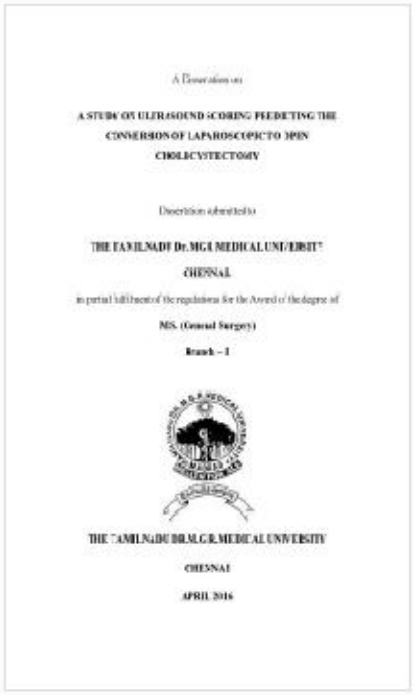

A Dissertation on

A STUDY ON ULTRASOUND SCORING PREDICTING THE CONVERSION OF LAPAROSCOPIC TO MINI CHOLECYSTECTOMY

Dissertation submitted to

THE TAMILNADU Dr.MGR MEDICAL UNIVERSITY CHENNAI

in partial fulfilment of the regulations for the Award of the degree of

MS. (General Surgery)

Branch – I

THE TAMILNADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI

APRIL 2016

ஆராய்ச்சி ஒப்புதல் கடிதம்

ஆராய்ச்சி தலைப்பு

பித்தப்பையினை அகற்ற துளைவழி அறுவை சிகிச்சை முறையிலிருந்து திறந்த அறுவை சிகிச்சை முறைக்கு மாற்றுவதின் காரணங்களை முன்கூட்டியே ஸ்கேன் பரிசோதனை மூலம் அறிந்துகொள்வது பற்றிய ஆராய்ச்சி

பெயர்	:	தேதி	:
வயது	:	உள் நோயாளி எண்	:
பால்	:	ஆராய்ச்சி சேர்க்கை எண்	:

இந்த ஆராய்ச்சின் விவரங்களும் அதன் நோக்கங்களும் முழுமையா எனக்கு தெளிவாக விளக்கப்பட்டது.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு என சம்மதத்தை தெரிவிக்கிறேன்.

இந்த ஆராய்ச்சியில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின்பேரி பங்கு பெறுகின்றேன். இந்த ஆராய்ச்சியில் இருந்து நான் எந்நேரமு பின்வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதைய நான் புரிந்துகொண்டேன்.

நான் இந்த ஆராய்ச்சியின் விபரங்களைக் கொண்ட ஆராய்ச்சித் தகவல் தாளை பெற்றுக் கொண்டேன்.

இதன் மூலம் எந்த பின்விளைவும் ஏற்படாது என்று மருத்துவர் மூலம் தெரிந் கொண்டு, நான் என்னுடைய சுய நினைவுடனும் மற்றும் முழு சுதந்திரத்துடனும் இ மருத்துவ ஆராய்ச்சியில் என்னை சேர்த்துக்கொள்ள சம்மதம் தெரிவிக்கிறேன்.

ஆராய்ச்சியாளர் கையொப்பம் **பங்கேற்பாளர் கையொப்பம்**

ஆராய்ச்சி தகவல் தாள்

சென்னை இராஜீவ்காந்தி அரசு பொது மருத்துவமனையில் பித்தப்பையினை அகற்ற துளைவழி அறுவை சிகிச்சை முறையிலிருந்து திறந்த அறுவை சிகிச்சை முறைக்கு மாற்றுவதின் காரணங்களை முன்கூட்டியே ஸ்கேன் பரிசோதனை மூலம் அறிந்துகொள்வது பற்றிய ஆராய்ச்சி நடைபெற்று வருகிறது.

நீங்களும் இந்த ஆராய்ச்சியில் பங்கேற்க நாங்கள் விரும்புகிறோம். இந்த ஆராய்ச்சியில் உங்களுக்கு பரிசோதனைகள் செய்து அதன் தகவல்களை ஆராய்வோம். அதனால் தங்களது நோயின் ஆய்வறிக்கையோ அல்லது சிகிச்சையோ பாதிப்பு ஏற்படாது என்பதையும் தெரிவித்துக்கொள்கிறோம்.

இந்த ஆராய்ச்சியின்போது இரத்தப்பரிசோதனைகள், அல்ட்ராசவுண்டு பரிசோதனை போன்ற பரிசோதனைகள் செய்யப்படும்.

முடிவுகளை அல்லது கருத்துகளை வெளியிடும்போதோ அல்லது ஆராய்ச்சியின் போதோ தங்களது பெயரையோ அல்லது அடையாளங்களையோ வெளியிட மாட்டோம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த ஆராய்ச்சியில் பங்கேற்பது தங்களுடைய விருப்பத்தின் பேரில் தான் இருக்கிறது. மேலும் நீங்கள் எந்நேரமும் இந்த ஆராய்ச்சியிலிருந்து பின்வாங்கலாம் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

இந்த சிறப்பு சிகிச்சையின் முடிவுகளை ஆராய்ச்சியின்போது அல்லது ஆராய்ச்சியின் முடிவின் போது தங்களுக்கு அறிவிக்கப்படும் என்பதையும் தெரிவித்துக் கொள்கிறோம்.

ஆராய்ச்சியாளர் கையொப்பம் **பங்கேற்பாளர் கையொப்பம்**

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr.D.Jegadhes Kumar
Postgraduate M.S.(General Surgery)
Madras Medical College
Chennai 600 003

Dear Dr.D.Jegadhes Kumar,

The Institutional Ethics Committee has considered your request and approved your study titled **"A study on ultrasound scoring predicting conversion from laproscopic to open cholecystectomy" No.18 022015.**

The following members of Ethics Committee were present in the meeting held on 03.02.2015 conducted at Madras Medical College, Chennai-3.

1. Dr.C.Rajendran, M.D.,	: Chairperson
2. Dr.R.Vimala, M.D., Dean, MMC, Ch-3	: Deputy Chairperson
3. Prof.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3	: Member Secretary
4. Prof.R.Nandini, M.D., Inst.of Pharmacology, MMC	: Member
5. Prof.P.Ragumani, M.S., Professor, Inst.of Surgery, MMC	: Member
6. Prof.Md.Ali, M.D., D.M., Prof. & HOD of Medl.G.E., MMC	: Member
7. Prof.K.Ramadevi, Director, Inst.of Biochemistry, MMC	: Member
8. Prof.Saraswathy, M.D., Director, Pathology, MMC, Ch-3	: Member
9. Prof.S.G.Sivachidambaram, M.D.,Director i/c Institute of Internal Medicine, MMC, Ch-3	: Member
10. Thiru S.Rameshkumar	: Lay Person
11. Thiru S.Govindasamy, B.A., B.L.,	: Lawyer
12. Tmt.Arnold Saulina, M.A., MSW.,	: Social Scientist

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

04 FEB 2015

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